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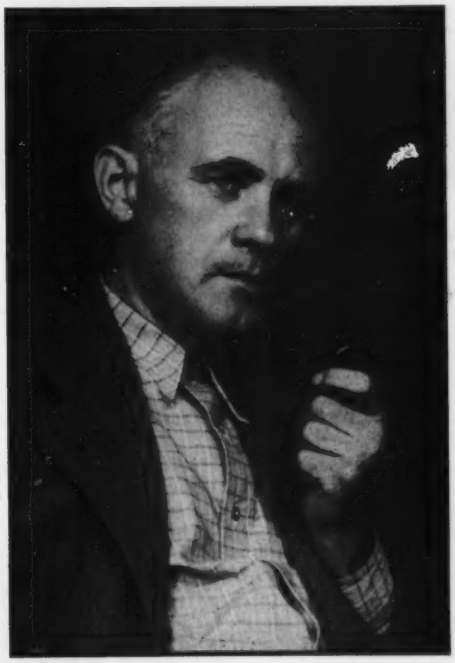

FIG. 93. Curt Backeberg has devoted more than twenty-five years to cactus research.

CACTUS AND SUCCULENT JOURNAL

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CONTENTS

PHILADELPHIA CACTUS AND SUCCULENT SOCIETY

Meetings at 2 p.m. on the second Sunday of October, December, February, April and June in Gates Hall—Morris Arboretum, 9414 Meadowbrook Ave., Chestnut Hill, Philadelphia, Pa. Learn more about these odd plants. Discuss your problems with the experts. All are welcome.

* * *

CHICAGO CACTUS SOCIETY OFFICERS—1954-1955

Mrs. Lyman Wilkinson, *President*
Mrs. Chas. Anderson, *Vice-President*
Mrs. Margaret Radden, *Secretary*
Mr. Orlin I. Wahl, *Treasurer*
Mr. E. O. Martinek, *Program Chairman*

The following are programs of the meetings:

January 24, *Zygocactus truncatus*

February 28, *Thelocactus-Pelargonium echinatum.*

March 28, Our president spoke of our interesting Cactus Journal and Henry Shaw Digest which Mrs. Radden brought for members to look at, and Cactus and Succulent discussions in general.

April 25, Rebutias and Lobivias.

May 23, Succulent Crassulas, Kleinias, Sedums, Sempervivums, etc.

June 27, *Hylocereus* and *Aporocactus.*

MARGARET RADDEN, *Secretary*

FROM MILLS COLLEGE

The car of tomorrow might have a chlorophyll battery! Gasoline would have a powerful competitor, should scientific research ever uncover the sun-power secret of chlorophyll. Owners of cars equipped with chlorophyll batteries could toss mileage expense worries out the window, and just let Mother Nature take her course.

The possibility of a chlorophyll battery is regarded as "definitely within the realm of high probability" by Howard E. McMinn, botany professor on the Smith Foundation at Mills College.

In a statement issued on the Oakland campus today, Professor McMinn voiced his belief "that scientific studies eventually will discover chlorophylls' secret for harnessing the energy of the sun."

Chlorophyll—the vital green pigment upon which plant as well as human life is dependent—is the only known substance in the world which can arrest the sun's power, and put it to use manufacturing food in green plants.

"Discovery of chlorophyll's secret," declares the nationally noted Mills College botanist, lecturer and author, "would unleash all sorts of wonderful new potentialities for the benefit of mankind."

"If the chlorohphyll pigment can force sun-power to manufacture food in green plants," queries Professor McMinn, "then why cannot we make that same energy run our automobile engines as well?"

The Mills College chlorophyll demonstration-exhibit was staged by the campus departments of botany and chemistry as a feature attraction of the 1954 California Spring Garden Show.

FIG. 94
The saguaro cactus (*Carnegiea gigantea*). Unique in the cactus family for its size, longevity and spectacular display. Estimated age is about 200 years.

The Nature of Adaptation

LOUIS E. BLANCHARD, A.B., M.D.

Adaptation is adjustment to life; it comprises evolutionary alterations in the structure and function of organisms. These reactions represent creative responses to environmental changes provided by nature or to conditions imposed by ourselves. They mainly concern the biological functions: inheritance and reproduction, structure and growth, biochemistry and physiology. Life can only exist by virtue of its adaptive ability. Impediments diminish survival value; expedients enhance it.

Extreme diversities of life are possible because of the inheritance of adaptive devices and unusual vitality; hence a cactus thrives in the desert; a swampy cypress flourishes in water; a lichen is at home on a barren rock. The various shapes, colors, and functional activities represent specific adaptations to an ever changing environment. Variations that are genetic in origin are *hereditary characteristics;* variations due to environment are *acquired characteristics,* and are not transmitted to the offspring. Climate, soil, and culture can influence the quality, but cannot change the genetic traits of the species.

The mechanism of genetic variations and its transmission from generation to generation are associated with the minute chromosones in the nuclei of cells. *Genes* (hereditary factors) within the choromosones, give inheritance its potentialities and a physical basis. These microscopic particles are composed of proteins and nucleic acids—a complex which controls the hereditary variations and biochemistry of all forms of life.

In a typical flowering plant, the somatic cells (body cells) have a definite number of chromosones characteristic of the species—this is termed the *diploid* number. On cell division, during growth, the chromosones *split* into identical halves—one set for each daughter cell. Division of the mother cell yields two similar daughter cells, each with a *full* number (*diploid*) of chromosones.

Gametes (sex cells), are produced from special cells by a form of cell division called *meiosis.* The chromosones *do not split,* as in body cells, but pair off and divide in cell division. This process reduces the number of chromosones of the sex cells to *half* of that present in the body cells—this is termed the *haploid* number. At fertilization, the fusion of the male and female gametes produces the *zygote,* which develops into an *embryo* or young plant. Inasmuch as the gametes were haploid, the zygote produced by their fusion will be diploid—each

parent contributed a set of chromosones. The hereditary factors associated with each parent will be incorporated in the new generation and create inheritable variations. This is entirely different from the variations acquired by the individual through the effects of environment, such as temperature, character of soil, and nutrition. Such modifications are temporary, reversible, and have no evolutionary significance.

The offspring resemble the parents, but never identically so. This is due to the universal character of all things, animate or inanimate, to vary in some degree. The slight differences in the minute structure and composition of the genes induce genetic modifications that reflect themselves as *variations* in the offspring. Such inherited distinctions provide a genetic plasticity that enable the species to adapt itself to the ever changing environment of evolution. This is in accordance with Darwin's theory of *Natural Selection*—in "the struggle for existence," there will be the "survival of the fittest."

Mendel showed how dissimilar features vary in their ability to manifest themselves in the *hybrid* plant. Thus, if a pure purple-flowered plant is crossed with a pure white-flowered plant, all of the F_1 (first filial) generation will resemble the purple parent in flower color. Mendel termed the purple flower color as *dominant,* and the white flower color, which does not appear in the F_1 generation, as recessive. However, if the F_1 generation is self-fertilized, the F^2 (second filial) generation will produce about three-fourths colored flowers and one-fourth white flowers. The white flower-color *concealed* in the first generation, is *disclosed* in the second. This *segregation* of alternative hereditary traits due to cross-breeding, forms the basic principle of inheritance. By selective mating, *pure* strains can be obtained.

Plants with disease-resistance as a dominant feature, have definite survival value; but plants with dominant *lethal characters,* such as albinism or structural or functional degeneracy, are biologically unfit and quickly perish. In hybridization, a high degree of diversity of genetic constituency in the parent plants is desirable, as it is often associated with *hybrid vigor* (heterosis). Such vigor represents the behaviour of contrasting factors combined in a hybrid. This results in robust growth, improved quality, and frequently increased resistance or immunity to certain diseases. The first hybrid generation possesses the maximum vigor; heterosis is rapidly lost in inbreeding. In order to maintain hybrid vigor, the yearly production of hybrid seed is essential, unless reproduction is accomplished vegetatively by cuttings.

The gradual loss of a function may be due to an adaptation that is not degenerative. Fungi and plants, such as Indian pipes and coral root, have lost their chlorophyll and require nonliving organic matter as a source of food. Such plants are called *saprophytes.* Some fungi require living organic matter; consequently, many diseases of plant and animal life are due to the depredations of such organisms.

The desert mistletoe, a partial parasite, has pale green leaves due to diminished chlorophyll. It grows in tufted masses on ironwood, catclaw and mesquite. Its modified roots (*haustoria*) penetrate the vascular tissues of the host and sap its energy; it functions through a structural and physiological adaptation. When abundant, these parasites may damage or kill the host. Broomrape of the American deserts, is a purple-colored root parasite; in appearance it resembles a bundle of asparagus shoots. Dodder is a parasite that frequently covers its host with a straw-colored mass of wiry growth. There generally exists a biological balance between host and parasite—the death of the host would bring a similar fate to the parasite.

Ordinarily, the origin of a new species requires many generations and possibly eons of time. It involves the slow evolutionary methods of variation and natural selection. However, there is a type of evolution capable of abruptly creating an individual very unlike its parents; this is known as *mutation.* In one generation, a pair of species may create a new species which breeds true to type. This phenomenal change is due to the accidental doubling of the specific number of chromosones. This type of evolution has produced some of the best varieties of plants, including tobacco, wheat, fruit, and flowers. The double flower sungold is a mutation of the common sunflower. The mutant usually arises from seed, but could be confined to a bud and is then known as a bud mutation. Such changes usually produce plants of greater vigor, larger blooms, and heavier foliage. Mutation rates may be increased by the use of x-rays, the drug colchicine, and ultraviolet radiation on the pollen or seeds. In nature, the mutagenic agents presumably are toxins, cosmic radiations, and radioactive compounds.

Chemical evidence attributes most of the effects of radiation to the ionizing of water molecules in the cells, thus producing active oxidizing agents (1). These oxidizers interfere with the normal cell function by inactivating enzymes and by producing toxic substances. Such interferences affect tissues in several ways: hereditary modifications, abnormal growth, or the death of cells. *Fasciation* (crest formation) in succulent

plants is probably initiated by such irritants. Mutations are common occurrences and usually involve minor changes; slight modifications have a better survival value. Drastic alterations which lack adequate adaptive quality will be eliminated by natural selection.

Mutation has special significance in virus and bacterial infections. These labile organisms are subject to variable mutations. Plants and animals ordinarily develop immunity to such infectious organisms and maintain a stabilized equilibrium with only minor damage. The abrupt creation of a virulent mutant, however, may produce disease in epidemic proportions. The hostile invader meets no resistance in its terrific onslaught, as the host has not had time to develop immunity. Such a catastrophe is due to a temporary imbalance in nature—the parasite having murdered its host, in turn must also perish.

Paradoxical as it may appear, death plays an indispensable role in heredity and life. It not only eliminates the biologically unfit, but also serves in the preservation of the species. In order to maintain life, lower forms consume those at higher levels. This interrelation of feeding habits maintains a balance in numbers. The lower the form of life the more prolific it is. At each level a certain number of its members become expendable, but sufficient survivors remain for continued propagation. Thus, vegetation, insects, song-birds and eagles may represent links in a natural terrestrial *food-chain*. An aquatic food-chain could consist of minute algae, little crustaceans, small fish and large fish. Every food-chain must have some form of green plant-life for its first link, as *chlorophyll* has a *monopoly* on the manufacture of food. This not only bestows the power of complete independency upon green plants, but also makes them, directly or indirectly, essential to all other forms of life.

Plants' structural mechanisms and functional activities appear in such harmony with the environment, that one is apt to personify their behaviour with unscientific explanations. To imply that a root grows in the direction of moisture in order to obtain water, or that a sunflower faces the sun to acquire more light, would credit plants with human intelligence. A root must grow in the direction of moisture because it cannot develop in dry soil. A plant necessarily leans toward the light as the auxins (growth hormones) on the shaded side are protected and cause more growth in that area; this compels the plant to bend in the opposite direction. Much has been written about the rigors of desert life. The descriptions of privation and distress are dramatic from a personal point of view. The gorgeous colorful displays of the desert in bloom, however, belie such a situation. Only plants in perfect balance can present the floral grandeur, which occurs in the desert. Unquestionably, during evolution, many species which lacked sufficient adaptive flexibility, were eliminated by natural selection. The survivors, however, are in temporary harmony with their surroundings.

In adaptation to environment, plants have not developed the power of locomotion; neither do they have consciousness and a nervous system, nor are they aware of their existence. These inabilities do not represent functional deficiencies, inasmuch as plants manufacture their food at the site of their location. There could be no advantage in such special functions, and it would be impossible for such complex useless mechanisms to evolve. Animals, however, have developed consciousness and a nervous system with special sensory organs, coordinated with a high degree of locomotion; these changes were all in harmony with their evolutionary advancement. Animals require locomotion to obtain their food, and consciousness coordinates the senses for adequate function.

There is a striking unity of life—the responses of plants and animals are quite similar. Adaptation indicates balance; it is flexible. When animals (e.g., sponges, barnacles, corals) can obtain food without locomotion, they become sedentary. On the other hand, plants such as certain algae and bacteria, are able to swim about. The insectivorous plants, Venus's-flytrap and sundew, have an unusual adaptation which enables them to capture insects. These plant motions are not initiated by a conscious mechanism, but vaguely resemble the reflex mechanism in animals.

Some lower forms of animal life have inherited an unusual capacity for regeneration. If a crab or a starfish loses an appendage, it grows a new one; if a lizard breaks off its tail when grasped, it will later regenerate the sacrificed portion. Still more striking, is the adaptive power of a small section of plant tissue to regenerate a complete individual (vegetative reproduction). This genetic characteristic imparts the complete pattern of life in most of the plant's component tissues; it presents a positive method for the continual propagation of choice flowers and fruits from cuttings.

Succulents are morphologically adapted for water storage. These plants, particularly the cacti, thrive in the terrific dry heat of the desert. Their special structural features allow expansion in rain and contraction in drought without surface damage. The moisture absorbed during the rainy season is stored in the thick leafless stems.

FIG. 95
Bald cypress trees (*Taxodium distichum*) in Florida swamps, showing their unusual respiratory mechanism (cone-shaped knees) projecting from the root system above the water.

Cacti have a low transpiration rate; this is due to their unusual defense mechanisms: extremely tough cutinization, densely pubescent surfaces, diminution in the number of stomata, and shade-producing spines.

Giant cacti, particularly the saguaros of Arizona, are physiologically adapted for slow growth. At the age of 10 years, a saguaro is the size of a man's fist; at 100 years, it is about 12 feet high and is just starting to branch; at 200 years, this desert monarch has full maturity, weighs about 15 tons and rises up to 50 feet. The rate of growth depends on the amount of available food (sugar) manufactured by photosynthesis. The difference between the food production in light, and its consumption by respiration during an entire day, represents the operating balance for the plant. When the daily storage-energy of photosynthesis is completely consumed in the expenditure of respiration, a plant is at its *compensation point*. At this stage, life is at a standstill and growth is impossible. The intense desert heat and brilliant light have a tendency to reduce the functional capacity of photosynthesis. The inhibition by *solarization* is probably due to enzyme inactivation. The reduced production, however, is offset by a still greater reduction of respiratory expenditure due to the cool nights of the desert. The net gain, though small, is adequate to produce huge plants in species with a genetic dominance of longevity.

Metabolic water has special significance in desert plants. A cactus stores its food in a condensed carbohydrate form (starch); on oxidation (respiration) this starch is decomposed into *carbon dioxide* and *water*. Thus, 100 grams of metabolized starch produces about 55 grams of metabolic water (2). The fats and proteins in cells—especially in seeds—function in a similar manner: the metabolism of 100 grams of fat yields 107 grams of water, and 100 grams of protein yields 41 grams of water. Due to their adaptive capacity for fluid conservation, the plants remain in balance on such synthetic water during periods of drought.

Desert animals are also adapted to live in water balance on metabolic water (3). Kangaroo rats, gophers, and rabbits thrive on dry starchy foods (seed and dry plants) their entire lives without a taste of water. Rigid fluid economy is essential. These animals require no fluid for their heat-regulating mechanism, inasmuch as they do not perspire. Their excreta are in highly concentrated forms, thus reducing water expenditure. They evade the major burden of heat by their burrowing and nocturnal habits. The adjustment is primarily chemical; they have no water storge mechanism. The fat in the tail of a Gila monster and in the hump of a camel is not only a storehouse of energy, but also provides metabolic water during food shortage. The desert flora and fauna are in balance with their surroundings. Contrary to general opinion, they

live without unusual stress or strain. Nature in balance is at ease; balance in the desert is at its best.

Warm-blooded animals have automatic heat-regulating mechanisms, which maintain uniform body heat, regardless of the temperature of their environment. This advantage confers the privilege of normal living in practically any latitude. Such animals generate heat within their bodies. The digestion of food involves the splitting of its complex structural components into simpler and soluble forms with the liberation of heat-energy—the energy of *configuration*. It is an exothermic (energy-releasing) chemical reaction, hence the transfer of excess heat becomes vitally important. The clothes we wear, even the furnaces in our homes do not add heat to our bodies. Obviously, a room-temperature of 70° F. could not possibly heat our bodies to its average normal temperature of 98.6°F. Such expedients merely modify the rate of heat dissipation. Woolens are poor conductors and retard heat loss, so we consider them warm. Linens are relatively good conductors, dissipate heat, and are thus suitable for the warm seasons. Colors also influence the rate of heat transfer; light colors *reflect* and dark colors *absorb* heat.

Plants and cold-blooded animals have no heat-regulating mechanisms and are dependent on *heat-absorption* from their surroundings for their vital activities. In plants, the process of *photosynthesis absorbs* heat from its environment; it is an *endothermic* (energy-absorbing) chemical reaction. Organisms, dependent on environmental heat, thrive only in suitable temperatures. This reduces their climatic range of activity. In cold weather, the physiological functions are reduced to a minimum that merely maintains existence. This adaptation is known as *hibernation* in animals, and as *dormancy* in plants. In such nearly suspended animation, a small quantity of stored food is adequate for a long resting period.

Some plants (e.g., certain algae, mosses, lichens) are adapted to withstand the extremes of abstinence and endurance. Such precarious living enables them to tolerate powdery dryness in periods of severe drought; however, they quickly resume normal activities when moisture becomes available. This adaptive plasticity has made these plants the pioneers of arid areas. Some lichens thrive on barren, windswept rocks and ledges where no other form of plant life can exist.

A lichen is a *composite* plant; it constitutes an intimate association of a fungus and an alga. This ecological relationship comprises a partnership known as *symbiosis*; it is an alliance of mutual benefit. The green alga manufactures sugar by photosynthesis; the fungus supplies moisture and anchorage for the lichen. They share the fruits of their labor and live in biological compatibility under extremely rugged climatic conditions.

Green plants require light for photosynthesis; it involves a transformation of electro-magnetic energy into chemical energy. The pigment chlorophyll in the presence of light, has the unique capacity to *combine* carbon dioxide and water to form sugar. Chlorophyll is the connecting link between the animate and the inanimate world; it alone has the power to breathe the breath of life into the dust of the earth. Photosynthesis is an endothermic chemical change which stores energy, and hence can continue only in the presence of light. The amount and intensity of light is variable; however, plants have developed active receptor pigments that capture the specific wave lengths essential for their photosynthesis. In the same latitude, marine algae (sea-weeds), which grow at depths of about fifty feet, are red; those at intermediate depths are brown; the surface growth is green. The red wave lengths, which are important in photosynthesis, cannot penetrate the deeper areas. Compensatory mechanisms, however, have evolved which make the energy of diminished light available. This is due to the development of photoreactive substances in addition to chlorophyll. The synthesis of various pigments represents a *chromatic adaptation* whereby the solar energy available at any particular depth may be efficiently absorbed and utilized. The same type of mechanism functions in plants growing in shaded areas, as in tropical jungles. This selective absorption of diffuse incident light accounts for their brilliant reflected colors, inasmuch as the color observed depends on the color absorbed. Chlorophyll is *always* present in colored plants, but its presence is masked by the supplemented pigments adapted for the particular situation. These additional pigments, by their *fluoresence,* convert wave lengths beyond the photosynthetic range, to wave lengths that are functional. Their relationship to depth and shade suggests a functional capacity of conversion similar to that accomplished in television. Here, through electronics, action and sound are converted into electromagnetic waves for transmission, and then reconverted into action and sound for reception. In nature, the accessory pigments associated with cholorophyll, functionally resemble electronic transformers.

The visible spectrum ranges between wave lengths of 7500 and 3500 Angstrom units. Within this zone are the *action spectra,* which

we ordinarily associate with photosynthesis: nevertheless, the accessory pigments may be effective photo-receptors for wave lengths outside this zone. Such a function would allow partial photosynthesis in darkness. Indeed, there is experimental evidence that this occurs in a limited way in the blue-green algae. These algae contain a pigment known as *phycocyanin*. The absorption spectrum of this pigment shows a high at 6000 Angstrom units and a low at 4800 units in the visible spectrum; it also shows a high absorption in the *ultraviolet region* near 2800 Angstrom units (4). The possibilities of additional action spectra beyond the range of visible light, may well account for the luxuriant growth on the ocean floor and in the dark jungles. Phycocyanin is absent in the red and brown algae, but the pigments they possess may have a similar function.

The adaptive ability of certain plants to thrive on a minimum of food is strikingly demonstrated by the sempervivums and cacti: these are able to colonize such difficult sites as apparently barren rocks. They obtain essential nitrogen, in part, from organic dust settling on the plants and rocks and accumulating at the roots and in the crevices. Even on flat surfaces, the associated lichens and mosses produce humus by their decay and also hold organic dust. In a similar method, epiphytes accumulate organic materials. *Oncidium altisissimum,* a West Indian orchid, produces a tangled mass of aerial roots as large as a hen's nest. This matted growth is a fine collector of ample organic matter essential for orchids. Another source of nitrogen is produced through the chemical action of lightning flashes. Atmospheric nitrogen, although abundant in air (about 80%), is unavailable to plants in its molecular form. Electric flashes produce nitric oxide, which settles on the surface as nitric acid; this quickly produces available nitrates on combining with limestone or other basic substances.

The bald cypress (*Taxodium distichum*), a deciduous conifer common in the Florida lowlands, is adapted to swamp life through an unusual respiratory mechanism — cone-shaped "knees" project upward from the root system, above the water, and function as breathing apparatus. Similarly, the mangroves (*Rhizophora*), evergreen shrubs in the tropical coastal marshes and in southern Florida, obtain their oxygen through "breathing stems," which arise from the roots above the water level.

Through *adaptive radiation,* plants may invade new areas, providing they have ample time to flower and produce seed. This depends upon the length of the day (photoperiod) at which the plant will flower. Chrysanthemums, which normally flower in the short days (long nights) of autumn, can be forced to bloom in the summer by shading the plants. The hormones essential to flower production is produced during *darkness*. Chrysanthemums can also be forced to bloom throughout the year by the techniques of shading or artificial lighting, depending on the season. Photoperiodic adaptation limits the range of plant migration; even such a vigorous pest as ragweed can only become established in certain latitudes. This weed requires a day-length of 14.5 hours to produce its flower-promoting hormone. In southern Ontario, the long summer days shorten to this period in early July, and pollen formation starts about the middle of August. The invasion is extensive and annoying, as it has ample time to scatter its seed before being killed by frost. In northern Ontario, the days do not shorten to 14.5 hours until mid-August. Ragweed flowering at that date will be killed by frost before its seed has matured. This characteristic governs its distribution. High altitudes also prevent the invasion of ragweed, because of early frosts. Plants adapted to 10-12 hours of daylight are definitely confined to tropical regions. They are biologically-fenced in their particular range by specific flower-promoting hormones. Plants with photoperiodic sensitivity will only produce maximum crops in a narrow zone of latitude to which they are indigenous—possibly 150 miles. Planting north or south of this optimum latitude will result in crop failure.

Mutual adaptations may exist between plant and animal life. Flowers, in particular, reveal this cooperative interrelation. They possess a showy variety of structures biologically adapted to the agents that cross-pollinate them. Their fragrance, nectar, and colors are the mechanisms which attract insects and certain birds. These visitors either gather their food, or in some instances deposit their eggs; but in so doing they inadvertantly transfer pollen from anther to stigma in the flowers. This economic associaton has been an important evolutionary factor in the lives of flowering plants and their pollinators. Such interrelation of contemporary and parallel evolution accounts for the intricate and varied array in both flowers and insects.

Wind is the pollinating agent of many plants (e.g., grasses, ragweeds, birches) with numerous but inconspicuous flowers. Such plants lack fragrance, bright colors, and nectar; hence they do not attract insects. Left to sheer chance, wind pollination is extremely wasteful; this is offset by the enormous quantities of pollen produced. It is estimated that a single ragweed sheds about 8,000,000,000 pollen grains in a half day, and

that 250,000 tons of such pollen are disseminated in one season in the United States.

Mimicry is a protective form of adaptation; it usually is a close external resemblance of an animal to some different animal or surrounding. This masquerading serves as a protection or concealment from mortal enemies. The harmless scarlet king snake closely resembles the poisonous coral species. Armed only with pretense, this imposter gains security by striking terror into his enemies. The green body of the Ceylonese walking leaf is so exactly shaped and veined, that its enemies cannot distinguish its camouflage from the surrounding foliage. The sensitive plant (*Mimosa pudica*), when touched, rapidly folds its leaflets in pairs, then droops its leaves. Such unusual movements, because of its mimicry of animal life, help protect the plant from insect harm.

Life is tempered and molded by hardship and struggle; only through adversity does it achieve its highest manifestations. Each living being through successive generations, inherits a vital spark from the original flame of Life, when Time was young—billions of years ago. The eternal struggle continues according to the designs and inexorable laws of Nature; until in the fullness of time and at its culmination, Life will share the destiny of its planet.

Box 67, Crystal Beach, Ontario, Canada.

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A Vacation Trip Through Southern Arizona

By ETHEL RUSH

On a morning in May, two carloads of desert "rats" left Los Angeles, California, at 3:00 a.m. on a short vacation trip, the party consisting of Mr. and Mrs. Bokarica, Mr. Edward S. Taylor, Mr. Rush and myself. We headed out highway No. 99, planning our first stop at Banning for breakfast but just as we were leaving Beaumont we were treated to a visit by the Beaumont motor police and after a short talk, they kindly gave us a reminder of their hospitality in the form of a traffic ticket and allowed us to proceed upon our way just as the sun started to rise. We later found out we had to pay $20.00 per car for their visit. What did we do? Oh, too much speed, they said.

We proceeded on to Indio passing through the Devil's Garden, where *Ferocactus acanthodes, Echinocereus engelmannii, Opuntia echinocarpa, O. basilaris, O. biglovii, Echinocereus mojavensis, Coryphantha alversonii* and *Dudleya grandiflora* are very plentiful.

From Indio we climbed the long grade to the top of the mesa where we passed through more cactus, then through about twenty miles of Ocotillos, *Fouquieria splendens,* of which there were literally thousands, mostly past flowering stage. Continuing along highway 60-70 through Desert Center for about 15 miles we passed through a group of *Olnea tesota,* the desert ironwood in the final stages of flowering. For one who has never seen this sight, let us say it was beautiful.

After passing through the town of Blythe, we crossed the muddy Colorado river into Arizona where we were greeted by the Arizona inspection station. After inspection we were on our way again.

About one mile into Arizona we saw our first Saguaro or Giant Cactus, *Carnegiea gigantea,* which are found in greater or less quantity throughout most of the state; most of the plants were showing their lovely white blooms. The flowers of these giant tree cacti open at night and remain open nearly till noon of the next day.

Between the California border and the town of Quartzsite we found many of the same cactus species which we had seen in California but also found some which had not shown up before, namely, *Ferocactus wislizeni,* the Arizona Barrel Cactus, *Mammillaria phellosperma* and *Mammillaria microsperma.* Mrs. Bokarica collected plants of *Mammillaria microcarpa* to add to their already large collection of Mammillarias.

At Quartzsite we turned south on highway No. 95 leading along the border into Yuma, some 80 miles to the south. Along this road, not too good, but paved all the way, we found *Opuntia acanthocarpa, O. ramosissima* and *Olneya tesota* the ironwood, and mile after mile

of *Opuntia wrightiana.* In this area along the base of the Kofa Mountains we also saw our first flowers of the desert Palo Verde, *Cercidium floridum,* rather bright yellow making a brilliant show.

Heading due east from Yuma we travelled through country much like that we had already covered, with much the same flora. About 30 miles before we arrived at Gila Bend we encountered a severe sand storm so instead of spending the night near Gila Bend as originally planned, we decided to go on to Ajo. By mistake we got off on highway 84 which leads to Tucson and had to go back and find the other road at Gila Bend, but along highway 84 about five miles out, we went through a very beautiful stand of *Opuntia fulgida,* the first plants of this species we had encountered.

Again on the right road to Ajo, we headed nearly due south through Black Gap, past Hat Mountain and Black Mesa and into the town of Ajo. This town can thank Phelps-Dodge Copper Co. for its existence for that is the only form of livelihood available to the residents. It being only 33 miles farther into the Organ Pipe Cactus National Monument, we decided to continue on to the Monument headquarters before stopping for the night. On this last 33 miles

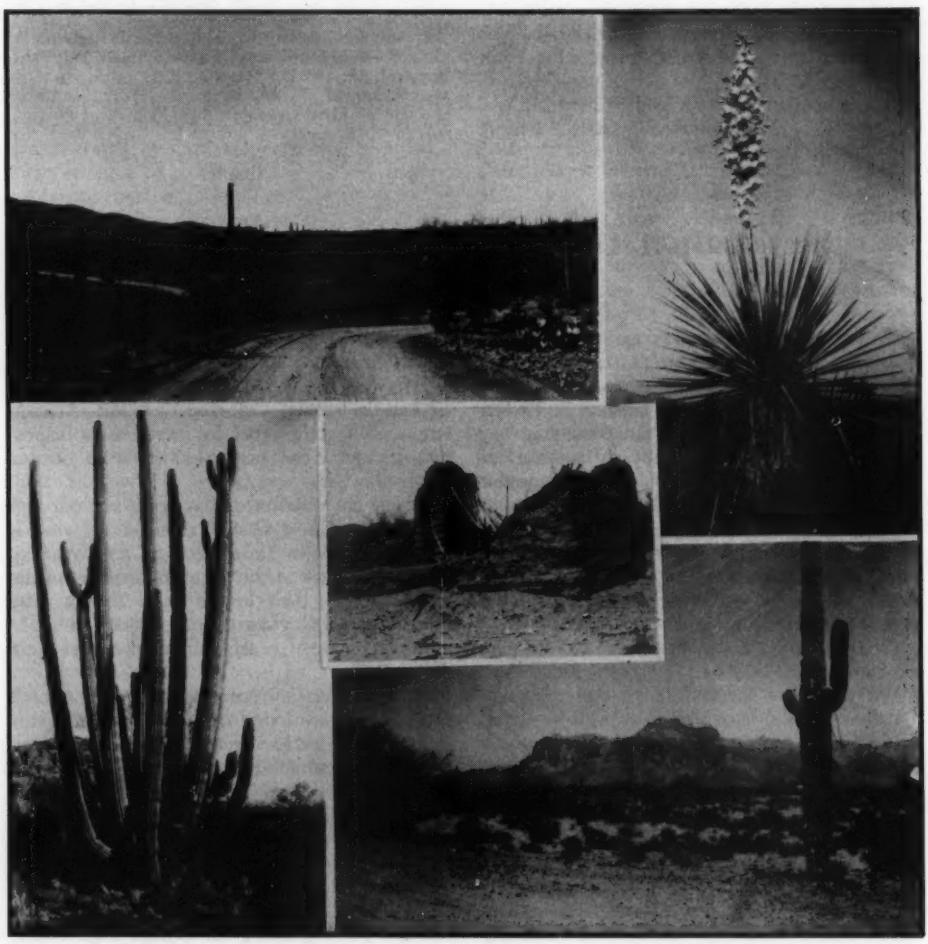


FIG. 96. *Upper left:* Road through the Saguaro National Monument. *Upper Right: Yucca elata* in the Papago Reservation east of Gunsight. *Lower left: Lemaireocereus thurberi* in the Organ Pipe National Monument near Ojo, Arizona. *Center:* Ruins in the Papago Reservation east of Tucson. *Lower right:* Badly abused Giant with Superstition Mountain in the background.

we saw the first of the Organ Pipe cactus, *Lemaireocereus thurberi,* a very distinctive plant and quite beautiful at this time.

Our first day had been stretched out to sixteen hours and we had covered nearly six hundred miles, so that as soon as our camp was ready and we had eaten, and had talked to Mr. Wm. Supernaugh, the Superintendent of the Monument, we retired and made up for lost time.

Up with sunrise the next morning, we decided to spend the day in the Monument, so after breakfast we left our camp, amid Saguaros and Organ Pipe Cactus, for the trip around the newly completed 40 mile drive within the Monument. A few miles out of camp we found plants of *Mammillaria nelsonii,* a recently described species found only in the Monument, so far as anyone knows. This is a very pretty, white spined plant which somewhat resembles *Mammillaria microcarpa* but which could not be mistaken for that species. We all failed to take pictures.

During the first part of our trip, the Organ Pipe Cactus was plentiful but the farther north we went the fewer we saw until finally there were no longer any of them, but the Saguaros were plentiful all around the drive. We saw plants of *Opuntia versicolor, O. spinosior, O. engelmannii* and *O. biglovii.* About fifteen miles out of camp we got out of the cars to look at some plants and stopped quite suddenly; a four foot rattler felt like arguing about our right to be there, so we let him have that area after taking his picture, and took our plant pictures at another place.

We saw and photographed plants of *Opuntia lepticaulis, O. clorotica, Agave palmeri, Echinomastus erectrocentrus, O. engelmannii,* with brilliant yellow flowers, past flowering stage and here we found our first plants of *Dalea spinosa,* the Smoke Tree, of which some were in flower. The flowers are a beautiful bluish purple.

At the southern most part of the circle drive a road branches off which crosses into Mexico a short distance to Quitobaquito. There are many large plants of *Lophocereus schottii,* the Sinita or Whisker Cactus; also in this region we find *Opuntia phaecantha, Holocantha emoryii* the Crucifixion Thorn, *Ferocactus covillei* and another large settlement of *Opuntia wrightiana.*

Also in the southern part of the Monument, one may find plants of *Peniocereus greggii,* the Night Blooming Cereus of Arizona. We found plants with buds but were about a month too early to catch the plants in flower.

Early next morning we left the Monument for the trip to Tucson, 137 miles to the east, passing many fine plants of *Olneya tesota* which had more flowers and deeper colors than the ones seen in California, and *Cercidium floridum.* About five miles outside of the Monument, at the town of Gunsight, you enter the Papago Indian Reservation and follow through it for many miles. Here the flora is much the same as that in the Monument except that you do not see *Lemaireocereus thurberi* or *Lophocereus schottii* but in their place you find *Yucca elata* and *Y. baccata.* Also here we find *Ferocactus wislizeni, F. covillei, Mammillaria fasciculata, Opuntia knuzii, O. kleiniea, O. arbuscula* and *O. spinosior.*

From here we went on to Mission San Xavior del Bok, located nine miles southwest of Tucson and photographed a number of buildings and the plants. Leaving here we went into Tucson, had lunch, filled our water jugs and cans with ice and fresh water and took the road south to Nogales. Few plants are to be seen along this highway as most of the land was being farmed when we were there, mostly a new crop of beans, also Sudan grass, rye, corn, etc. About 20 miles north of Nogales we again commenced to to see some cacti, principally the cylindrical Opuntias. The highway from Tucson to Nogales is fenced on both sides of the road so makes poor collecting or photographing territory. We also saw a flock of about 2000 sheep on our way.

We left the cars in Nogales, Arizona, and walked across the line to Nogales, Sonora. For a Mexicon border town it is quite large, built largely up the sides of the hills and of course it caters particularly to the American trade.

We left Nogales for the return to Tucson about 4:00 p.m. and turned west a few miles out of town on Ruby Road which runs through the hills to Sesabe. Along this road we found *Mammillaria macdougalii* and *Echinocereus rigidissimus.* Returning to the main highway we stopped at Mission Tumacocori to photograph and then continued on through Tucson out to the Saguaro National Monument where we camped just outside of the Monument for the night.

Early in the morning we made the drive through the Monument and photographed many things: plants, buildings, etc. There is no water to be had in this Monument; they haul it all from Tucson, 17 miles away. We found *Mammillaria olivea,* said to grow only in the Monument. We also found a beautiful crest of *Echinocereus fendlerii* and found *Agave palmeri* in flower. We met and had a talk with Mr. Samuel A. King, the Superintendent of the

Monument, a very nice person and very helpful. While driving through the Monument we watched several deer that were watching us and also saw a beautiful crest of *Carnegiea gigantea.*

As our time was growing short we reluctantly headed the cars north to Casa Grande and then on to Florence, the home of the Arizona State penitentiary and on to Florence Junction where we pointed our noses west on highway 60-70 to Apache Junction where we took pictures of Supersition Mountain and "Snowbeard" the Dutchman. We were now on our way to Phoenix where we passed Papago Park.

Then on to California through Blythe. The rest of the trip home was over the same route we started on.

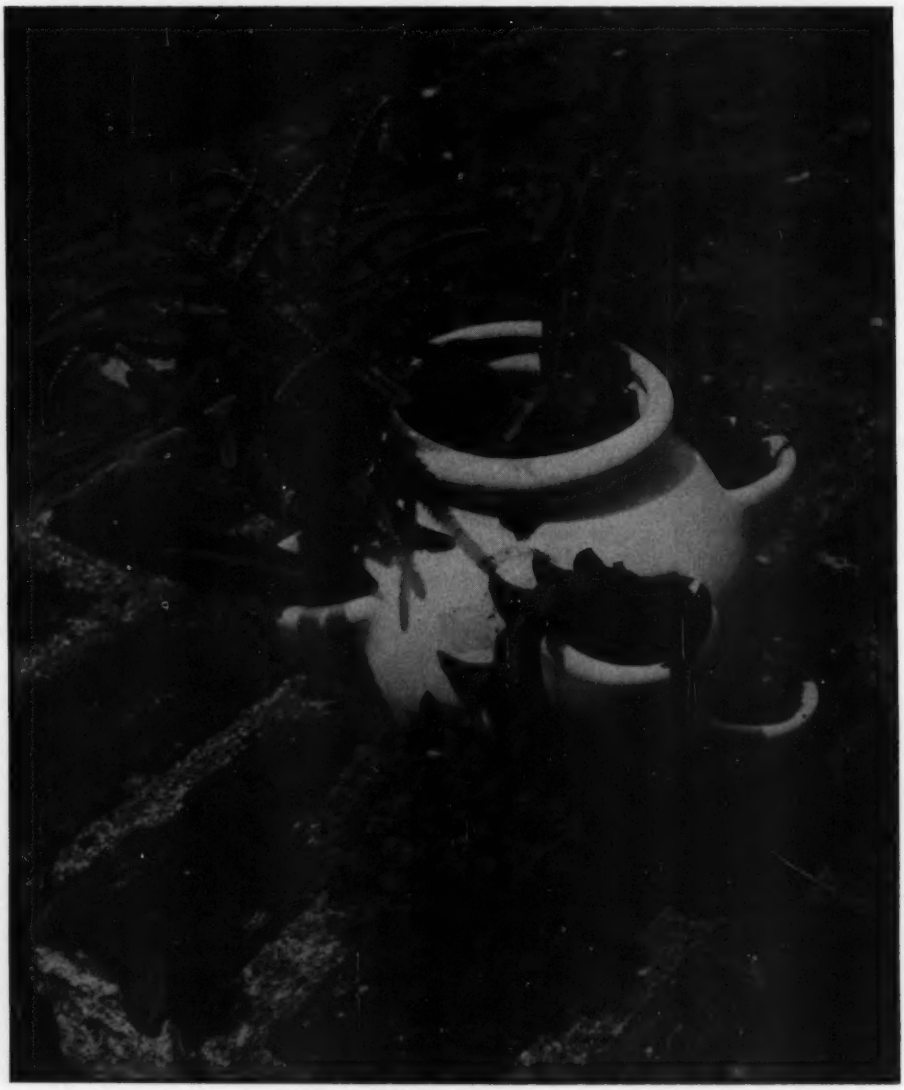


FIG. 97. A planting by Marjorie Wihtol, N. J.
A *Kleinia stapeliaformis,* planted in the top of a strawberry-pot dives underground and reappears in the pocket at the left of the picture. The diving shoot can be seen at the base of the plant. Other plants are (clockwise): *Cyanotis somaliensis,* a *Sempervivum, Tradescantia navicularis, Sedum dasyphyllum* and, at the upper left, sharing a pocket with the traveller, is *Crassula lycopodioides.*

FIG. 98. Part of the prize winning out-door exhibit of the Cactus and Succulent Society of California at the California Spring Garden Show at Oakland, California, April 29.

CACTUS AND SUCCULENT SOCIETY OF CALIFORNIA, OAKLAND, CALIFORNIA

June 27 about twenty of our members headed by Pres. Myron Kimnach and Secy. John L. Hastings journeyed to the home of Mr. and Mrs. J. W. Dodson, 721 Edgewood Road in Redwood City.

This was a bring your own lunch and picnic affair after which a short business session was held. We then adjourned to Mr. Dodson's large glass house where is housed one of the finest collections of Haworthias in the country.

Mr. Dodson was exceedingly kind in giving us much information regarding the history of the Haworthia, their culture, etc. Two of the most popular and hard to get of the Haworthias are *H. maughani* and *H. bolusii*. The former is similar to *H. truncata* but *H. maughani* has leaves in a whorl while in *H. truncata* the leaves are opposite. In *H. bolusii* we have a plant similar to *H. setata*, the difference being in the hair-like leaves of *H. bolusii*. Both are not easily grown.

Mr. Dodson's large collection of Haworthias shows his many years of hard work and research including his volumes of information he has gathered here and there and put in book form from manuscripts of botanist and collectors. Many of these were copies and translations from foreign authorities, some of which were as far back as the 15th century.

E. L. MUELLER

Meeting of July 11, 1954

The July 11th meeting of the Cactus and Succulent Society of California was held at the University of California Botanical Garden in Berkeley.

After a brief business meeting an old-time charter member, Harry Bettencourt of San Leandro, was greeted and welcomed back after an absence of many years. He gave a brief talk comparing the collecting of cacti then with material available now.

Paul Hutchison, with the aid of President Myron Kimnach gave a resume of what is being done in renovating the outdoor cactus garden, and the result already shows that a great deal of time and effort has been expected. The project is an extensive one and when completed the garden will be one of the finest of its kind. It will be attractive and educational for the general public as well as the cactus and succulent enthusiasts.

After the meeting the group inspected the plants in the greenhouses. Here, too, a lot of work has been going on—plants moved out to make room for new material from South America. Everything looked wonderful and well cared for. Surplus plants were distributed among the members.

The visit to the Botanical Garden is an annual event and I am sure everyone is already looking forward to next year's picnic meeting there. It is one of the highlights of our club's activities.

ANNA M. GENASCI, *Affiliate Secretary.*

Dear Editor:

Just a note to tell you that I enjoy the Question and Answer Column by Harry Johnson; I hope it will continue. Also, I enjoyed the photos of Howard Gates in the July-August issue.

Editor's Note: As stated so many times before, we will be glad to have a more extensive Question Column IF members will send in their questions to Harry Johnson, Johnson Cactus Gardens, Paramount, Calif.

Peyote at Shafter, Texas, in the Big Bend

Dear Editor:

As a newcomer to your field, that of succulents and cacti, I do not know if precise distribution of plants is of any importance or not, but I am writing with the thought that our chance discovery of peyote (*Lophophora williamsii*) in the Big Bend of Texas, if not of importance, at least might be of interest.

My knowledge of this plant is through the use the Indians make of it, especially the Kiowa-Apache. As an Anthropologist my interest is in the cultural significance of the plant, and only secondarily in its habitat or botanical nature. I have read most of the literature available concerning its use by Indians, and consider Wetson La Barre's "The Peyote Cult" (published by Yale University Press in 1938) one of the best over-all statments. A more recent publication by J. S. Slotkin on "Menomini Peyotism" (published by the American Philosophical Society in December of 1952) is without doubt the best detailed, functional study of its use by a single tribe.

The Indians with whom we lived for a year in 1933-34, the Kiowa, Kiowa-Apache, and Comanche of Oklahoma, usualy obtained the plant by shipment from Roma, Texas. They preferred, however, making trips to the fields where it grew, across from Roma in old Mexico. Every male Indian was anxious to have the experience of seeing peyote growing in its native habitat at least once.

So far as I recall in the literature, it is my impression that the plant is thought to grow in the lower reaches of the Rio Grande and into old Mexico in *non-freezing* areas. The Indians cannot grow the plant in Oklahoma except by protecting it from the weather. Even in a more moderate climate here in central Texas, it has not been possible to grow the plant out of doors, yet we have relatively mild winters. Twenty degrees is unusually cold for us. During many winters it never gets that low. Fifteen degrees is exceptional, and once in the memory of the oldest people, it got down to around zero for a day or two. But even during mild winters my peyote has frozen. Partially this is due to the amount of rain we experience here. At any rate, it has been my impression that peyote freezes rather easily. I find the African succulent *Stapelia variegata,* hardier!

You can, therefore, imagine our surprise when we found peyote growing around Shafter, Texas, during the summer of 1949. For three summer months we lived in that deserted ghost town. We found the vegetation so fascinating that we usually spent an hour or two each evening before sunset exploring the hills surrounding the town. This is when we became really interested in cacti, and we tried to see how many different species we could find on these walks. One evening as we were exploring a hill just south of the town, my wife called to me that she thought she had found peyote. I knew she must be wrong, for the winters there are too cold. But she had found several. They were growing on the crest and south slope of a very sandy hill. None were on the west, or north, or east exposures of the hill. We collected about a dozen of the perfect specimens, most of which I still have. The few specimens I lost were in another attempt at outside planting here in Austin. Shafter is usually ten to fifteen or even more degrees colder than Austin during the average winter. However, there is probably less humidity and less cloudiness there, so that the southern slopes of the hills are warmed each day and in that way protect the plants from injury. Although we remained in the area for about two months after we first found peyote, and al-

FIG. 99. *Lophophora williamsii,* commonly called Peyote. Photo by Haselton.

though we roamed far afield evening after evening, for we were interested in seeing how widely the peyote ranged, we could find no others, except for this one hill side.

In this search we saw hundreds of specimen of *Ariocarpus fissuratus*—the Living Rock or Texas Star. They are all over that area. During the summer we collected one or two specimens of each species of cacti, and the few friends who visited us always admired the Texas Stars. Several wanted specimens, so we obliged by taking them to hills where they grew. Each time we were amazed that although our friends literally stod on the plants they could not see them. Our friend who had collected other cacti and consequently had some experience in searching for the plants, had thirteen specimens of Texas Star within a radius of three feet around him. Yet he could not see them; and they were not small plants but two or three inches in diameter. Even when he stod still and I counted the specimens around him he thought I was kidding, until, as he put it, they all of a sudden jumped out at him. After that he had no trouble finding them.

This is similar to the experiences of the Indians in locating peyote. Many an Indian has told me that although he stood still he could not see the peyote until *the plant made itself visible to him*. They say that many Indians cannot find the plant, for they are not in the proper frame of mind and the plant will not make itself visible to one who is angry, mean, evil. To them peyote is something sacred, divine, holy, and their attitude reflects this belief. It is not difficult to understand why them regard peyote as being mystical, for the plants are difficult to see until they literally spring out at you. And of course the narcotic properties of the plant have unusual effect, as is so well known from the literature especially Aldous Huxley's recent and somewhat disappointing *The Doors of Perception*.

I was unusualy fortunate in being allowed to attend two all-night peyote meetings held by the Kiowa-Apaches. I ate peyote and I was affected by it, but that is another story.

In the Jan.-Feb., 1954, issue of your JOURNAL, you carried a notice indicating it was a narcotics violation for anyone to have or sell peyote in Texas. "Peyote" is listed as a narcotic in the amended Texas penal code of 1953. In March of this year a case against a Mirando City man who was arrested selling and possessing peyote was thrown out of the Laredo, Texas, courts on the basis of spelling. Consequently the legality of the plant is in question. The implication now is that it can be sold, bought and possessed in Texas.

When we returned from Shafter in September of 1949 we had space to bring with us only one or two of each of the species of cacti that we found, except for the dozen peyote plants. That was more or less the beginning of our interest in cacti. Except for collecting a few of the specimens around Austin we have made no additions to our street-corner cactus garden.

But for some reason or other the succulent bug bit me a year or so ago. Since then I have acquired all that I can purchase around here—which is several dozen specimens—and recently have sent off for others. Also I have read everything I can find on succulents and am much more interested in them than in cacti. That is why I reverse the twins and say succulents and cacti.

Recently a neighbor, Dr. J. M. Coleman, noticed our collection and introduced himself. He has shown me your JOURNAL and I have just seen several issues. This has given me an interest in cacti and made me realize what we missed when with friends we spent five weeks touring the plateau area of Mexico in the summer of '53. We were in Hidalgo, Queretaro, and Guanajuato and I have only a vague impression of seeing the cacti of those states. Had it been my car and had I been driving I might have stopped, but I wasn't sufficiently interested to suggest doing so! Now how I want to go back and see *Astrophytum ornatum, Cephalocereus senilis,* and the many others I vaguely recall seeing. We saw the many large forms, especially on the road to Oaxaca, but we did not at that time have the interest to see, or even know we were seeing the others. If only I had had this interest a year ago! How much one has to know *mentally* to be able to see and hear fully. One doesn't see with eyes or hear with ears, but only through them. Real sight and hearing is in the mind. We envy those who have had this interest in succulents and cacti and will try to make up for lost time.

GILBERT MCALLISTER

EDITOR'S NOTE: *Lophophora williamsii* has been studied and publicized perhaps more than any other cactus. At present it is illegal to sell or grow this plant which violates the California laws. For collectors it has been a very satisfactory plant to grow since it is easy to reestablish even with its turnip-like root, and it flowers easily in cultivation. Some of the more important articles that have appeared in this *Journal*, are: Vol. III, No. 3, Vol. IX, No. 3, Vol. XII, No. 11; the latter contains an extensive bibliography selected from more than 400 references in past writings.

REPRINT OF A LETTER FROM MR. J. A. JOHNSON, WILMINGTON, DELAWARE

To answer your questions about Krillium. This isn't exactly right down my alley although I have made a couple of experimental batches of soil conditioners for the Du Pont Company. I haven't seen the latest reports on the field tests that were conducted this summer, but I can report my findings on one batch I tried.

Regardless of the trade name, these Soil Conditioners are being sold under, Krillium, Loamium, Soilium, Soil Conditioner W., Fluffium, and a dozen other names most of them are made from Polyacrilonitrile, manufactured by American Cyanimide Co. With the exception of one being sold under the name of Fluffium, they are about equal in value although there is quite a variance in the cost per cubic foot of soil they will treat. The more reputable companies print on their containers just how much soil can be treated with a given amount of material although you have to use a pencil and paper to figure out what that amount is. Other companies just give directions as to how the stuff should be applied and say nothing about the depth of treatment. If any of you are thinking about trying these soil conditioners—read the labels on the containers of several brands before you buy, keeping in mind that the most economical one to buy is the one that treats the greatest cubic footage and not square footage. In spite of some of the wonderful claims made in some of the advertisements, these soil conditioners aren't the complete answer to a gardener's prayer. *If you already have good soil, they are of little or no help.* Their main purpose is to make a clay soil more easily penetrated and more retentive of moisture. They agglomerate the fine clay particles and reduce the usual caking about after a rain or watering. They maintain a mulch of the top soil and reduce the labor of cultivation, *but have no fertilizing value.*

I have seen an ad by one company that claims spectacular results on lawns in seven days. I'm not sure, but I suspect that there is some Urea mixed with this conditioner. I've tried Urea and it will boost grass or any leafy crop in about that time. After the first week the results are not so noticeable. The Urea, which contains about 46% Nitrogen, has been used up and you are right back where you started from unless you have a market for a fine lot of grass clippings. If you have use for a high nitrogen fertilizer, it's much cheaper to buy it alone than pay the price it would cost to have it incorporated with something else.

I don't think though, nitrogen in any great quantity is good for either cactus or any of the other succulents. They don't exactly come under the classification of "leafy" crops. Soil conditioners are intended for the fellow with the small garden and not for the farmer. They are much too expensive to be used on any but a very small scale. They are not for soil in good tilth and therefore not for the Cactophile who uses a good potting soil. If any of you try them out, however, I'd like to have your opinions on the results.

My experience with a soil conditioner that is not yet on the market indicates that it is good only under certain circumstances. This spring, I treated 20 square feet to a depth of 6 inches. The soil was a very heavy yellow clay. It did not cake on the top and cultivation was much easier than it was in the untreated control patch. There was no improvement in growth. The few cacti and succulents I stuck in along with other things didn't do well in either plot. The ground was altogether too heavy for them.

I find too that on the treated plot, the clay was packed, two inches below the surface, as hard as on the untreated section. I'm sure if I had bought the soil conditioner, I would have considered it money wasted in this instance. However, when I seeded some bare spots in the lawn early this fall, I used the conditioner again in one place and have had better germination of seed and a better, thicker stand of grass than on the untreated part. My conclusions are: I wouldn't use it for the cactus or succulents—it can't replace a good potting soil.

When we moved I didn't have time or material to fix up a cactus bed outdoors. Still haven't gotten one built but most of the succulents have done very well in the heavy clay. I wish now that I had put more of them outside. Those indoors have suffered for lack of water and attention. *With few exceptions, the Sedums, Pachyphytums, Echeverias and Haworthias grew well in soil that packs so hard it can't be crumbled in the hand once it dries out.* The cactus didn't like it one little bit but some of those succulents have grown completely out of bounds.

(*Courtesy Frank Mark, Tucson, Arizona*)

* * *

WHAT PRICE EXPERIENCE

What price is it worth for experience? The old proverb of "Experience is the greatest teacher" has a very important part in any cactophile's enjoyment of cacti and succulents.

The first contact with this group of plants was obtained when my wife purchased about two dozen succulent plants and wished the job of potting them on to me. (My first and only observation about cactus had been in our local deserts.) I potted them in pure washed sharp builders sand thinking it came close enough to resembling the sand of the desert, at the same time using a stopper in the bottom hole of the pot to prevent water leakage all over the shelves and floors. Then twice weekly a watering program was started! It was only a few weeks until rot and sudden death of plants was the reward for my "I know it all" smart Alec attitude I was assuming.

When the post mortem was performed on the last of those plants, a sudden awakening to the fact I had absolutely no knowledge of where the plants were originally collected, their environment, growing season, soil conditions or botanical name, only a pretty selling name attached to it, which seemed to fit the plant in a imaginary sense. Another great fallacy that I assumed was that plants from arid areas should be planted in direct sunlight. Many a young plant or seedling was burnt to a crisp. Since then, observation in good collections and in habitat conditions shows that most plants are sheltered one way or another during the hottest part of the day. The opposite was my practice based on "more sun more flowers," never stopping to think they had to have a resting period the same as other plants. Therefore my original efforts were both expensive and very discouraging. Still to this day I often ask others and also myself, "what am I doing wrong with a given plant that does not respond to my cultural methods?"

NICHOLAS BOKARICA

FIG. 100. A mass planting in Balboa Park, San Diego, California, is a practical ground cover with a long period of flowering.

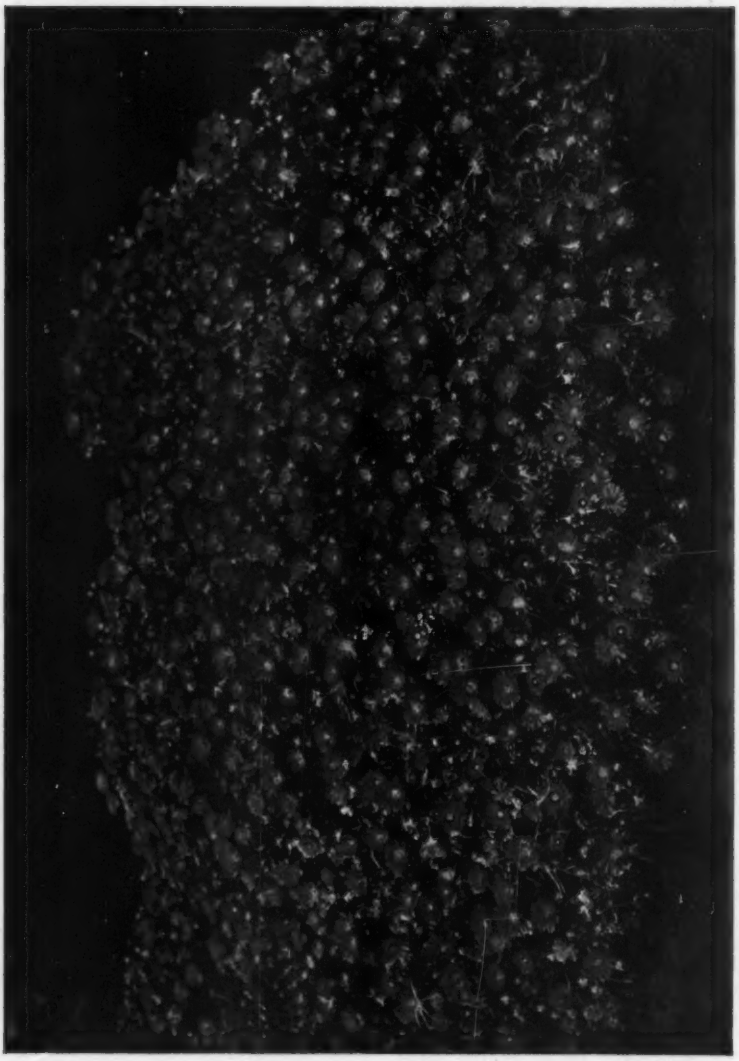
Colorful Noon-day Flowers from South Africa

The Mesembryanthemums, noon-day flowers, are generally known as low spreading growers with conspicuous flowers during the sunny hours, which the name, from the Greek, signifies. They are sensitive to cold so need the mildest climates for their best development. As ground covers they are superior perennial plants requiring the least of care and water, and are easily increased by cuttings planted in the open during the winter and spring. Along the entire California Coast where there are bare and sandy sections, they would be a conspicuous and lasting improvement, as many of the varieties are strong growers with an excellent green foliage.

The first botanical records were made in 1649, with a list of fifteen species, by 1689 twenty-three were listed, and now within 300 years, over 2000 species have been found and described. Most of them are located in South Africa, a few have been acclimated in Australia and Southern Europe, and two in California. These two are in Southern California only, along the coast. *M. crystallinum,* our well known ice plant called a weed, and *M. aequilaterale* (*Carpobrotus chilensis*) bearing fair sized crimson flowers.

Most of the regular Mesembryanthemums are summer and day bloomers, some flower in the afternoon only, and a few are night bloomers. There are quite a few fine ones that are fall and winter bloomers, and some that are everbloomers regardless of the season, only needing the sunshine to keep them open. The majority are perennials and a few only are annuals. A most interesting fact concerns their seed pods. They do not open and shed the seed when mature like other plants, but remain tightly closed until the rainy season, when they open and the seeds are scattered at the right time for germination. The flowers show a range in size from a few millimeters to three inches in diameter. Their colors are very brilliant and vary from purest white to a very deep, rich red, purple, shades of lavender, and many yellows. Their brilliancy is due to a very simple feature of the structure of the petals, every cell of the epidermis being a small optical apparatus, like a combination of a concave mirror with a prism of which the base is convex.

M. speciosum (*Drosanthemum speciosum*) (see color plate), is a superior light green bushy foliage variety with choice copper, red and orange shaded flowers. At flowering the plant is



Natural color photo by Franklin Price Knott, Santa Barbara

Mesembrianthemum speciosum Haw.

Now called *Drosanthemum speciosum* (Fig. 101)

conspicuous at a long distance. It makes an excellent hedge two feet high and about as thick and stands a light shearing. Considered one of South Africa's best varieties and was introduced to California by E. O. Orpet of Santa Barbara about twenty-five years ago.

The many species of Mesembs come from places having widely varying local climates, and to give all the species the same treatment is bound to cause failures with a number of them. Each species or group must be studied individually and given treatment suited to its particular requirements. A number of shrubby species, as for example *Drosanthemum speciosum* and *Mesem. brownii* obviously require plenty of water during summer and will die if allowed to go too dry. But many of the extremely succulent species, e.g. *Lithops, Conophytum, Titanopsis, Pleiospilos,* etc., grow in very arid places, and probably receive what little moisture they do get during the winter. These plants are very insistant on a resting period. We cannot rest them in winter on account of that being our rainy season, and they are preeminently out of door plants which should not be grown (here) in greenhouses. If therefore we water such plants in summer they are apt to either rot during summer because they try to go into a dry dormancy then or else they die the following spring from exhaustion at being overworked. They seem to survive through the winter, probably on account of that being their natural season of growth and maximum vigor, and then rot when warm weather comes.

SOIL EROSION SPECIES

E. O. Orpet of Santa Barbara has provided those used by the State Highway department and others. He furnished during one winter 7000 cuttings for a sand binding problem near San Jose where a big industry was bothered by sand in the wind. This was *Hymenocyclus* var.

There are two others, merely differing in color or habit that have been used most by the State Highway people. Mesembs. planted in the winter thrive and do the job. The most striking example is the one on Santa Monica terraces to hold the soil—the plants hang on by their toenails.

One time he furnished the Army Camp at Lompoc, two truck loads of two other species, both Drosanthemums. The one proviso was that planting must be done when there was moisture in the soil. All these kinds are *stem rooting* when they can get a root-hold in moist earth or sand.

A recent road-side planting in Rosemead, California, used a million plants. The one objection is that a planting of this kind catches trash thrown from automobiles.

DROSANTHEMUM FLORIBUNDUM

The small leafed, rosy lavender flowering variety is one of the favorites for a care-free slope cover. You can grow it where you need a ladder to plant it. During the latter part of May, all of June, and early July, it looks like a colorful velvety carpet. The rest of the year, it's gray-green. One objection to this variety is that it gets woody and messy underneath. To correct this, shear back heavily after blooming.

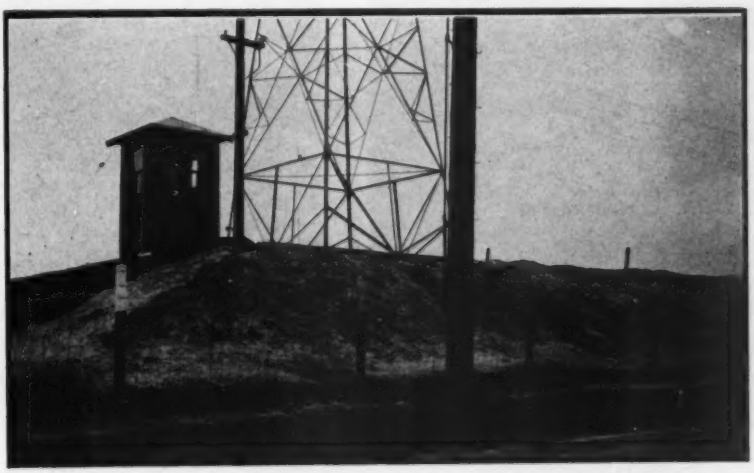


FIG. 102. *Drosanthemum floribundum* planted around an oil tank farm in Long Beach, California, serves as a fire protection and erosion control.

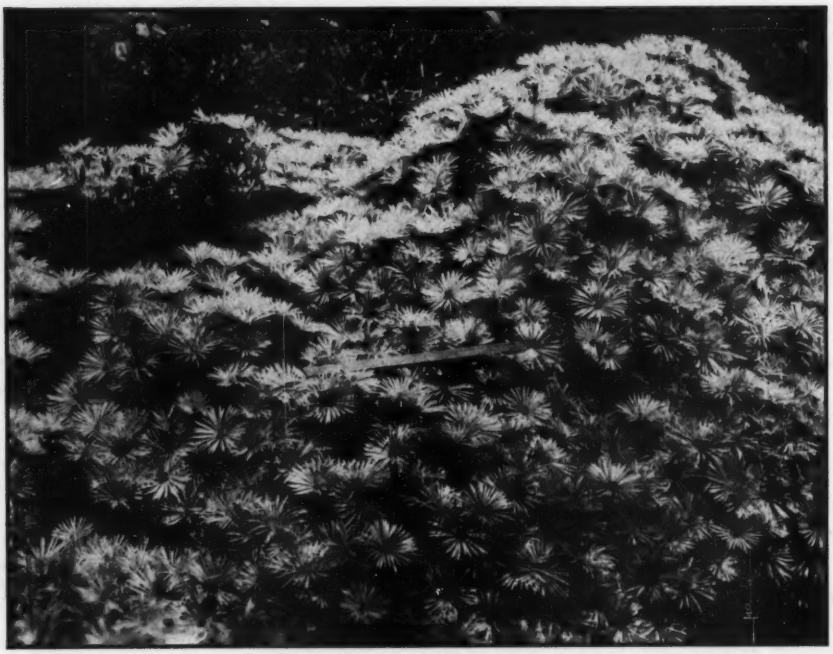


FIG. 103. The plants are completely hidden by the magenta flowers which are less than an inch across on *Drosanthemum floribundum*.

FIG. 104. Moisture and dormancy can be controlled in pot culture.

FIG. 105
Drosanthemum speciosum (Haw.) Schw.
Flower bud showing the characteristic, dew-drop-like papillae.

Kleinia tomentosa and Its Synonyms

By H. M. BUTTERFIELD

The succulent plant often grown under the name of *Senecio tomentosa* and also listed at times as *Kleinia tomentosa, Senecio haworthii, Cacalia canescens* Wild., *Cacalia tomentosa, Cacalia haworthii,* and *Senecio cinerascens,* challenges botanists to find the correct name. The horticulturist has enough problems of his own to maintain good cultivar names and looks to the botanists to fix a satisfactory name for this succulent with which most of us are familiar. We may review some of the problems involved in finding a name and point out some of the history of the plant.

An important question for botanists to settle is the generic name. Should this plant be referred to *Senecio* or *Kleinia,* or some other genus, such as *Cacalia*? The writer is not a botanist and will not attempt to suggest any final opinion on the correct name but will have a preference until the matter has been temporarily settled by botanists.

In the Compositae, there are four genera with ray flowers lacking, and all with bracts of the involucre distinct or united only at the base: pappus of bristles. These four include *Senecio, Gynura, Emilia,* and *Kleinia.* At least some of the plants formerly listed under *Cacalia* are now synonymous with *Kleinia. Senecio* differs from *Kleinia* in minor points. Distinction on the basis of climbing or not is hardly possible among the succulent forms. The leaves of *Kleinia* are said not to be clasping, but often cylindrical and the plant is succulent. *Kleinia* is sometimes distinguished from *Senecio* mainly by the disk florets having style-branches minutely cone-tipped; with heads of disk-florets only, which are white or pale yellow. This genus name is for J. Th. Klein, 1685-1759, German naturalist. Botanists will have to decide what the present basis is for separating *Kleinia* from *Senecio* and perhaps review the reasons for any decision made. In earlier days the succulent plant under consideration was placed under *Senecio* because botanists claimed there was an absence of conical points to the stigma. (See Curtis Bot. Mag. XCIX T. 60-63, Nov., 1873, where this plant is referred to *Senecio haworthii* Sch. Bip.)

In seeking reasons for selecting a particular botanical name, the writer contacted Dr. Reid Moran, well known to many California succulent growers for his work with *Dudleya* and other plants. With his botanical training and interest in succulents, his opinion should carry some weight. His first statement is, "The plant appears to be correctly called *Kleinia tomentosa* Haworth, if you wish to recognize *Kleinia* as distinct from *Senecio.*" If such a separation is not made then "the name of this plant is a question. It cannot be called *S. tomentosa* because that name was used first for a different plant (in 1796); in fact the name has since been used illegitimately for at least six species other than the *Kleinia.* Schutz-Bipontinus made the combination of *S. haworthii* for the *Kleinia* in 1845, but this is antidated by *S. haworthii* Steudel based on *Cacalia vestita* Haworth. I have found no reference to the place of publication of *Cacalia vestita,* either in Index Kewensis or elsewhere. Therefore, I do not know whether *Cacalia vestita* is the same plant as the *Kleinia* or not. If it is the same plant, then the correct name of this plant in *Senecio* is *Senecio haworthii* Steudel. If it is not the same plant (and I rather imagine that it is not), then the *Kleinia* cannot be called *S. tomentosa.* In this case there is, so far as I know, no legitimate name available for the plant in the genus *Senecio,* and a new name must be coined. Thus the whole question hinges on the identity of *Cacalia vestita* Haworth. In order to locate the original description of the species, it may be necessary to make a systematic search through the publications of Haworth."

"Perhaps the simplest solution is to call the plant *Kleinia tomentosa.* The genus will be accepted in Hortus III, and it is accepted by S. F. Blake, the specialist in Compositae."

"The reference of *Kleinia tomentosa* to *Senecio cinerascens* in Hortus II is an error: this is clear from the description given there of *S. cinerascens.* The error evidently arose from the fact that *S. tomentosa* Salisb. (which is not the Kleinia) is apparently the same as *C. cinerascens.*"

A discussion of a special form of *Kleinia tomentosa* has been presented in the *Cactus and Succulent Journal* (see Vol. XVII, No. 10 for Oct., 1945, p. 134 'Cass's Variety,' J. R. Brown). It may be of interest to readers to know that a plant of this type was distributed in California a good many years ago by a Dr. Roediker near Los Gatos and the writer obtained a plant of this form from Mr. Archie Burns of San Rafael. It is my understanding that the original plant of this form came from Germany. However, since the late Mr. Charles L. Cass of San Diego se-

FIG. 106. *Kleinia tomentosa* (*Senecio haworthii* Sch. Bip.) as pictured in Curtis Bot. Mag. Vol. 24, Third series, Nov. 1, 1873. The succulent we grow today seems to be essentially the same.

cured his plant as a mutation from the normal form, the evidence suggests that such a mutation may arise at various times and in various places. A plant of this sort should probably be referred to as a mutation of the normal species. The writer is sure of his observations regarding this special form. In the large-leafed form, a cross section of at least part of the leaves will be a little more compressed than normally found on the typical species. This causes more or less of a ridged effect running lengthwise of the leaf. There may be more of the white tomentum under favorable growing conditions, however it may not be safe to say that the leaves are whiter on one form than on the other unless grown under exactly the same conditions and unless the grower has made wide observations. It is easy to claim such a correlation when it does not actually exist in a plant. In all breeding work it is important to base an opinion on enough individuals to have any real significance to the observation. We know that pubescence can vary widely on plants and the same is true of white spines on some cacti. There may also be some variation in leaf form without the variation being truly significant or characteristic of a special form, so further observations should be reported with the hope that any consistent difference will be found and associated with a special form. The writer has noticed the more angled form of leaf on the form grown by Cass, and seen many years previously in central California. Apparently there is some difference in leaf form as well as in size, however the drawing in Curtis Botanical Magazine may suggest that some of the leaves are slightly ridged or compressed in the normal form, which may be referred to for the present as *Kleinia tomentosa.* This succulent plant was introduced into England in 1795, according to Curtis Magazine. Alwin Berger in *Stapelieen und Kleinien,* Stuttgart, 1910, p. 391, refers to *Kleinia cana* as resembling *K. tomentosa* and there may be forms that have shorter leaves than the normal, however the ordinary plants found in California include only the typical species, *K. tomentosa* and 'Cass's Variety.' These are now so well known and generally available that the names should be standardized in catalogs and literature.

PERUVOCEREUS Akers gen. nov., or HAAGEOCEREUS Backbg.?

By C. BACKEBERG

(From *Sukkulentenkunde* II, 1948, pp. 46-49)

Translated by Myron Kimnach

In the 5th issue (May 1947), page 67, of the Cactus and Succulent Journal of the American society, a new genus of Peruvian coastal Cereii has been described: PERUVOCEREUS Akers g.n. The main characteristics are: "flowers solitary and produced mainly from the top of the stems but may be produced from anywhere along the stems, from a lateral pseudocephalium or from a central pseudocephalium," "diurnal, opening in the afternoon of one day and closing in the morning of the next day—narrowly funnelform —the limb expanded and rotate." It says further: "Backeberg erected a new genus *Haageocereus* which included both Britton and Rose's genus *Binghamia* as well as some of these new day-blooming, colored-flowered plants." Aker's type is *Peruvocereus setosus* Akers.

How should we treat this so-called new genus (which strangely enough has escaped the notice of well-travelled collectors, such as Ritter, Blossfeld and myself, when at Lima)? The expert is first startled by two assertions: first, that a plant can form a terminal, as well as a lateral, pseudocephalium; this is quite unlikely. Also fig. 46 (p. 67) merely shows a heavier development of bristly hairs on the end of the stem. The pictured plant represents *Haageocereus pseudomelanostele* (Werd. and Backbg.) Backbg. Of course this was described as white-blooming, as this was the only flower-color I saw. On the other hand, in "Neue Kakteen," page 74, I said that *Haageocereus chosicensis* (Werd. and Backbg.) bloomed lilac-red (page 47: violet-rose), and in "Kaktus-ABC": "Blomsten lilarosa til rödlig," with a var. *albispinus* and a var. *rubrispinus.* I have even seen nearly white blossoms. Akers also described a *Peruvocereus salmonoides* sp. n. in the same Journal, July '47, No. 7, from the Rimac Cañon above Chosica, which from the picture, color of flower, and habitat is identical to the similar-blooming *H. chosicensis.* In the issue of August 1947, No. 8, p. 121, he describes a *Peruvocereus rubrospinus* sp. n. which is identical (even to the name!) with my variety *Haageocereus chosicensis* var. *rubrispinus* Backbg. (from "Kaktus-ABC").

Akers' type for his genus is identical with my type for *Haageocereus* (*H. pseudomelanostele*), even to the "numerous bristle-forming spines" and "Also, especially in the area of the crown, with similar-colored spines" (Werd. and

Backbg., "Neue Kakteen," p. 74-75). Here, to be sure, the flower is described as greenish-white. However, *H. chosicensis* demonstrates that the flower-color varies in these species. A parallel case of an abnormal species is *Lobivia famatimensis,* which ranges from white through yellow to red with all the shades in between, so that at best we can speak here only of varieties.

The expression "pseudocephalium" chosen by Akers is misleading, because as I have said before there is only a heavier growth of bristles which are not as in *Setiocereus* but are simply hairy bristles around the spines. Thus the odd expression "lateral- or central-pseudocephalium." As to the definition of "diurnal," Akers himself says: "opens in the afternoon and closes next morning." This is the case with *Haageocereus;* it is hardly necessary to give Porsch's "Definition of Flowering-times" in order to say that it is not a day bloomer, but a night bloomer, and so a genuine *Haageocereus.*

Species of B. & R.'s *Binghamia* and of my *Haageocereus* (to which the new genus *Peruvocereus* really belongs) have been confused under these names. According to the International Rules of Nomenclature the genus is established by the type, in this case *Haageocereus pseudomelanostele.* It represents my genus *Haageocereus,* and therefore also those species described by Akers under *Peruvocereus.* There can be no question of a confusion with members of other genera, therefore *Peruvocereus* is a synonym of *Haageocereus.* Moreover, Britton and Rose's genus *Binghamia* had already been used for one of the Algae and would have had to be renamed if I had not chosen the name *Haageocereus;* this is also recognized by Marshall in his last revision. The correct nomenclature is as follows:

Haageocereus pseudomelanostele
var. *setosus* (Akers) Backbg.—bristles light-colored, red or rose-scarlet blooming.

Haageocereus pseudomelanostele
var. *longicoma* (Akers) (C. and S. J., June 1947, No. 6)—with long dense bristles.

As Akers says that "only a few specimens were found" perhaps it is just a form of the above.

Haageocereus chosicensis
Syn.: *Peruvocereus salmonoideus* Akers.

Haageocereus chosicensis var. *rubrispinus*
Syn.: *Peruvocereus rubrospinus* Akers.

Therefore *Peruvocereus* consists of very long-known Haageocerei of the Rimac district, and only a reddish-blooming variety with somewhat longer bristles, a variety of the type of my genus, can be considered new. It is remarkable that the German collectors overlooked this showy cereus. Nevertheless it is desirable *in setting up new genera, besides first thoroughly examining past literature, that such important terms as "pseudocephalium" and "day- or night-blooming" be correctly defined.*

At this time I will review the species of the genus *Haageocereus,* which I have thoroughly studied on the whole Peruvian coast from north to south. My discoveries are marked by an asterisk; two of the rarer species are illustrated:

NORTH PERU: DESPOBLADO
**Haageocereus versicolor* (Werd. and Backbg.) Backbg.
**Haageocereus versicolor* var. *aureispinus*
**Haageocereus versicolor* var. *lasiacanthus*
**Haageocereus versicolor* var. *xanthacanthus*
**Haageocereus talarensis* Backbg.
**Haageocereus humifusus* (Werd. and Backbg.) Backbg.

NORTHERN WEST-COAST
**Haageocereus pacalaensis* Backbg.
**Haageocereus laredensis* Backbg.

CENTRAL PERU, IN THE COASTAL REGION AND FOOTHILLS
**Haageocereus pseudomelostele* (Werd. and Backbg.) Backbg. Type of the genus
Haageocereus acranthus (Vpl.) Backbg.
**Haageocereus chosicensis* (Werd. and Backbg.) Backbg. and var. *albispinus* Backbg.
var. *rubrispinus* Backbg.
**Haageocereus olowinskianus* Backbg.

SOUTH PERU: LA JOYA
**Haageocereus platinospinus* (Werd. and Backbg.)

SOUTH PERU: COASTAL REGION
Haageocereus decumbens (Vpl.) Backbg.
**Haageocereus australis* Backbg. (more fiercely spined than the above)

COASTAL REGION OF CENTRAL PERU
And in addition, from Akers:
Haageocereus pseudomelanostele var. *setosus* (Akers) and var. *longicoma* (Akers)

All these plants belong to the most beautiful and easily-grown species of our cereus collections. The fruit, the construction of the flower, and the appearance of the longitudinal cross-section, all fully agree with the illustrations of Akers.

Because of the hairy funnelform tube of the nocturnal flower, the genus is a member of the tribe *Trichocerei* Berg.

POSTSCRIPT:

As this article was being finished, the American Journal for 1947, No. 9, arrived, in which Akers on page 143-144 describes a *Peruvocereus viridiflorus;* the most important points: "segmentibus interioribus viridibus vel virido-albescentibus," also "epidermis sage-green—bristles and hairs lacking—central spines occasionally." In the areoles "short, white kinky hairs," by which is meant a white tomentum since the lack of hairs and bristles is expressly stated.

The picture shows a typical *Haageocereus acranthus* (Vpl.) Backbg., with the exception of the more numerous radial spines; all other characteristics agree, also the color of the spines, the length, etc., as well as the "occasional" presence of the central spine. Here also *Lobivia famatimensis* is an example of the enormous variability which can be found in the number, kind, length and color of the spination in a single species. Finally, concerning the "green flowers," described as greenish-white, I need merely refer to Werderman's description of *C. acranthus* Vpl. in "Neue Kakteen," p. 74, where he definitely states "Flowers greenish-white." The length is also the same.

Finally, because of the greater number of radial spines in the above new species, the plant must be named thus: *Haagerocereus acranthus* (Vpl.) Backbg. var. *viridiflorus* (Akers): with a greater number of radial spines. This variety was found with *"Neoraimondia macrostibas* (more correctly: *roseiflora*), *Espostoa melanostele* (more correctly: *Pseudoespostoa melanostele,* as this genus has no grooved cephalium as *Espostoa* has) and *Binghamia acrantha* and *Milas";* in other words, the cactus flora of the Canta road which is typical for the distribution of *Haageocereus acrantha.* But it is strange that Akers does not differentiate his species from *"Binghamia acrantha."* What plant does Akers consider to be *Binghamia?* It is to be regretted, despite the beautiful and detailed descriptions accompanied by very fine photos and drawings, that in this point in favor of a new genus he failed to give detailed comparisons with earlier described species. Because of this the name of the above variety is not quite suitable, as *Haageocereus acrantha* also blooms greenish-white. The name should rather refer to the greater number of radial spines. Britton and Rose, incidentally, described the flowers merely as "white," but this was corrected in Werderman's description in 1931.

These descriptions of Akers bring up the wish again for an international agreement concerning such new species, especially with the important (because it is scanty) cactus flora of the Peruvian Cordilleras, thus preventing a further accumulation of synonyms.

AKERS' REPLY

Backeberg is trying to justify his mistakes on the classification of cacti in Peru, and that his finds were so relatively meager and that he missed seeing so many good plants. The latter is not surprising as Backeberg found plants following in Britton and Rose's footsteps. Neither of the above gentlemen really had a chance to do a thorough job. Backeberg made one or possibly two trips to Matucana, whereas I made several hundred, so you can see the difference. Note the errors in his arguments:

(1) *Peruvocereus setosus* is not the type for *Peruvocereus*, but rather *P. salmonoideus.*

(2) His reference to experienced collectors and the expert is rather good—I'm no expert, but I have put many more days in the field than has Backeberg and his German colleagues.

(3) His statement that *P. setosus* is merely a variety of *P. melanostele* is false. *Setosus* is entirely new. Both I and Harry Johnson have grown Backeberg's plants to maturity and can see that *setosus* is entirely different and very shaggy with hair.

(4) His statement that plants in my description formed both a terminal and lateral pseudocephalium is false. I said they can form either and I was referring to separate species.

(5) My type is not his type species as he states.

(6) His remarks on pseudocephalium is ungrounded as he has never seen the plants with this type of growth. (He apparently hasn't seen all the JOURNALS yet.) The plants I referred to did not have merely numerous bristle-forming spines but woolly pseudocephaliums similar to *Espostoa.*

(7) His remarks on nocturnal versus diurnal are unwarranted also. Assume plants flower 1 p.m. to 10 next morning.

1-7 daylight and 7-10 daylight—total 10 hours.

Seven to six at night total 11 hours actually—flowering is about 50-50 but they open originally in the bright light of day. If we were as fussy as Backeberg we would consider *Echinopsis* as nocturnals as over 50% of their flowering period is at night. They—to make matters worse—open at night. *Binghamia,* in my opinion, open 5 to 7 p.m. or later and close by 6-8 in the morning.

(8) His *Binghamia choisicensis* var. *rubrospinus* is a doubtful variety with slightly more orange spines, whereas *Peruvocereus rubrospinus* is bristly and quite red-spined—the nearest red of any cactus I've seen. Coupled with its free-flowering and garnet red flowers, it comes from an entirely new locality. *Peruvocereus* has a very narrow range of distribution whereas *Binghamia* has a wide range. This is a further proof of a new genus that has evolved rather recently. Most of the older genera have wider distributions; varieties of *B. acrantha* covering 500 miles at 3000 feet to nearly 10,000 feet.

(9) All his arguments about International Rules is based on my using the same type species which is false.

(10) *Peruvocereus salmonoideus* is quite distinct from *chosicensis* being much greater in diameter, different spine pattern, flesh pink, free blooming, against rarely blooming, lilac rose, much shorter plants with different seeds.

(11) I have not changed Backeberg's species as most of them I haven't verified. *Peruvocereus chisicensis* and *P. pacalaensis* are both good Peruvocereii. *Binghamia olowinskiana* is a large arching night-bloomer. Species *decumbens* and *australis* are both night blooming, salverform Binghamias or Haageocereii.

(12) *Peruvocereus viridiflorus* is nothing like *Binghamia acrantha* having many more ribs, much different and finer spine pattern and a greenish day-blooming flower. The two grow side by side and even a *child* could tell them apart.

IN DEFENSE OF PERUVOCEREUS

Extract from an article by PROF. DR. FRANZ BUXBAUM in *Sukkulentenkunde* III, 1949, p. 24.)

" . . . Akers' article ["A Key to Some of the Peruvian Genera," Cactus and Succulent Journal XX, 1948, p. 128-131] is distinguished by clearness and brevity and contains a very lucid key which, as I see it, separates *Peruvocereus* and *Haageocereus*—while Backeberg tries to show that *Peruvocereus* is a synonym of *Haageocereus*. But I must confess that he does not quite convince me. Akers cites for *Peruvocereus* "flowers diurnal" and for *Haageocereus* "flowers nocturnal," and his use of these terms is to be sure rather questionable, considering the anthesis for *Peruvocereus* (afternoon till next morning); yet it must be noted that orange- to red-colored flowers, even though they stay open at night (an inheritance from night-blooming ancestors!) are, in the biological sense, day-bloomers. The most important difference, however, is to be found in the flower-form: *Peruvocereus*: "Small rotate," and *Haageaocereus*: "medium large, salverform." This last description matches Akers' photo of a typical "*Binghamia* species" (unfortunately without specific name), as it also does Backeberg's of *Haageocereus decumbens* and *H. olowinskianus*. Akers also stresses the difference in growth. Backeberg's polemic is thus not very convincing, for he has extracted only one doubtful point from Akers' diagnosis and uses it as a point of controversy; moreover he states that the type species of *Peruvocereus* was given by Akers as *Peruvocereus setosus*, whereas in reality Akers explicitly states in his diagnosis: "Type species: *Peruvocereus salmonoideus*" (Cact. and Succ. Journ. XIX, 1947, p. 68). Did Backeberg not see this? It may be correct that *Peruvocereus salmonoideus* is identical with *Haageocereus chosicensis*, but certainly not with H. *pseudomelanostele*. As I [elsewhere] mentioned, and as Akers points out, the true *Haageocereus* species are very close to *Trichocereus*, in any case much closer than those placed by him in *Peruvocereus*. The floral difference between *Haageocereus* and *Peruvocereus* is certainly not less than that between most Trichocerei and *Trichocereus fascicularis* which Backeberg considers a generic characteristic [of *Weberbauerocereus* Backbg.]. I will not start an argument on nomenclature here, especially as neither Akers nor Backeberg describe the inner construction of *Haageocereus* flowers (why are genera continually established without thorough research and exact comparative diagnoses?!). I fear, however, that a new "*Binghamia* confusion" will now arise unless we treat these two genera (which are doubtless closely related) in the only correct way: by uniting both groups as *subgenera*.

But when Backeberg reproaches Akers for not having sufficiently studied previous literature, he must also be thus reproached when he quotes in his article an incorrect type-species, and then bases his argument on this misquotation! . . ."

Growing Cacti and the Other Succulents in England

By C. KILBOURN

The charm of the appearance and the pride in the good robust, clean growth of a healthy cactus plant yields a sense of enjoyment and pride that no other class of plant can equal, plus a never-ending source of interest and achievement. When difficulities have been over-come and troubles averted, the reward is a handsome plant whose delight amply repays the collector for all the care and attention he gave to it. At first he was probably attracted towards them because of their bizzare appearance and unique form. Later he learns more of their charm and is anxious to provide all he can towards what is necessary for their well-being and good health. To him there is no other class of plant that gives the same wonderful exhibition of exquisite flowers and whose stems even after the flowering period present so great a source of interest all the year round.

To the majority of people, the mention of cactus conjours up a picture of a prickly pear which is probably the most representative of this class of plants. There are, however, many hundreds of genera representing many thousands of different varieties each a never-ending source of interest in the unique and novel form of growth that only cacti possess. One might well ask why it is that cacti alone of all life can endure and even flourish in regions of drought and intense heat. This question could not be answered in a few words or justice would not then be given to the ingenious methods that nature has resorted to in order to produce a form of life capable of existing where all others perish.

To appreciate the remarkable structure which has been evolved in the cactus family, it is necessary to understand the vital processes by which a plant grows. To maintain healthy growth a plant needs to obtain chiefly ten elements: carbon, nitrogen, magnesium, potassium, calcium, oxygen, hydrogen, phosphorus, sulphur and iron. With the exception of carbon, these are all obtainable from the soil in the form of salts dissolved in water. The fine root-hairs at the tips of the rootlets are the only part through which a salt solution can be absorbed, the rest being covered with a corky layer. Only dilute solutions can pass through the cell wall which can exercise no discrimination although the layer of living protoplasm within the cell has a certain selective action.

Besides the above elements, sodium, chlorine, silicon and others are present in the soil and though not necessary to the plant are absorbed by it. The salt solutions obtainable are very dilute and therefore a very large amount is necessary to obtain enough of the salts required; obviously a plant cannot continue to take in a further supply of water after the cells have become turgid, but if water is given off by any part of the plant body then the two processes of intake and outflow will result in a continuous flow of water through the plant. Water in the form of water vapour is given off continuously by the leaves and to a lesser extent by the green stems, leaving the dissolved salts in the plant body.

The leaf surface consists of a more or less thickened layer or cuticle, in which occur pores or stomata; these vary considerably in size and structure but the general principle is that two adjacent cells are capable of opening and closing the small orifice between them which connects directly with the inner tissues of the plant, and thus the amount of water vapour escaping can be regulated. The rate of flow of the stream that passes through the plant depends then on two factors—the rate of absorbtion by the root hairs, and the rate of emission by the stomata, and these are dependent on the water content of the soil and air respectively.

The most important element for the plant is carbon, since this is the basis of cellulose which forms the framework of the plant, and this carbon can only be obtained from the air in the form of carbon dioxide. The stomata, besides allowing the passage of water vapour outwards (transpiration) also act as breathing pores by which air containing carbon dioxide enters the tissues of the plant (respiration). In the presence of sunlight this gas is decomposed by the action of chlorophyll (the green coloring matter) so that oxygen is set free and the carbon converted into various complicated organic compounds such as starch and insoluble sugars, the process being known as "photosynthesis" or "carbon assimulation." These insoluble organic compounds are again broken down during darkness to form simpler substances which are soluble and can therefore be carried through suitable channels to different parts of the plant where they are required for the formation of cellulose, the substance of which the cell wall consists. The building up process is rapid but the subsequent breaking down is slower, and accumulation of the products may occur; thus starch, fats, oils, etc., formed in excess of present requirements may be stored until needed. Excess carbon is liberated in the form of carbon dioxide and given off by the plant. Thus, during sun-

light hours plants absorb carbon dioxide and give off a certain amount of it during the night.

When the soil and air are unusually dry it is necessary for the plant to make some sort of adaptation to combat these adverse conditions. If the roots can obtain very little moisture and the air causes the stomata to remain closed, the transpiration current will be considerably slowed down; this is obviously liable to result in the plant obtaining too little nourishment both in the way of salts from the earth and carbon from the air, so that a balance has to be struck. In cacti and similar succulents a very interesting modification of the normal process is found to occur: The breaking down process which has been described as taking place during the night is not carried so far; instead of carbon dioxide being liberated, organic acids are formed and not until daylight do these break down further to free the carbon dioxide which can then be at once used in the process of photosynthesis without ever leaving the issues of the plant.

Cacti also show a peculiar type of respiration, the rate being slower in the day-time than at night; this is the reverse process of normal plants, where the stomata open more during the day than at night; the stomata in cacti are found to be wide open at night and almost closed during the day.

A special provision that cacti must make is a means for water storage. A special water storage tissue has consequently been evolved. An important feature of this tissue is that it is capable of losing a very large amount of this stored water (even as much as 60%) without any permanent damage. An interesting theory has been propounded as to the cause of succulence in plants; it appears that when the water content of a cell is very materially reduced a chemical change takes place which results in the normal carbohydrates being replaced by others that have an enormous water holding capacity. Thus aridity would lead directly to succulence, an increase in the water holding capacity being automatic. Many varieties of cacti are fluted or ribbed which allows for an accordion-like expansion and retraction in times of rains or drought. They are in most cases entirely without leaves as we know them in other plants. This obviously reduces the surface liable to losses of moisture through evaporation though the rate of growth will be consequently slower. For the same reason many cacti are spherical or globose as a sphere encloses the greatest bulk per surface area.

Since the chemical process of cacti is slowed down by their environment, there is an accumulation of by-products. These may be entirely useless to the plant as in the case of Calcium Oxalate, which in some varieties crystallizes from the cells in great amounts. Other by-products, such as wax are deposited on the skin where they serve the useful purpose of preventing excess evaporation and partial shielding of the stomata. The formation of spines which is found on a large number of xerophytic plants serves as a means of protection, but it is very probable that they are formed by excess accumulation of silicon in the plant. Silicon is useless as nourishment but may be used to give rigidity as in some grasses. In any case, the formidable array of spines that most cacti possess is sufficient to discourage the attentions of man and beast alike who would desire to quench their thirst from them. In this respect cacti are often grown as protective hedges where they form a barrier more impassable than barbed wire.

Depending on the nature of water supplies, cacti develop either a deep tap-root or an extensive net-work of roots near to the surface, in order to avail themselves of every possible drop of water.

Flowers of cacti are often out of all proportion to the size of the plant which bear them. They are large and extremely attractive, many varieties vying with orchids in the beauty of their blooms and fragrance. That they flower but once in seven years is a fallacy engendered of ignorance and an inability to give these responsive plants the correct treatment under cultivation. If given the proper treatment however, very few cacti are tardy in flowering and setting seed. The seeds themselves germinate readily and provides a further interest in cactus culture.

CULTURAL HINTS

There are a large number of recommended soils and some quite contradictory statements as to the finer points in cactus culture. Personal experience, as ever, is the best teacher but there are certain broad principles that must be adhered to for success to be possible. Cacti are indigenous over a very large area, (the greater part of the New World) and soil requirements vary a great deal with a plant's native habitat. The collector very soon becomes acquainted with those best suited to the needs of his own plants, if he remembers that experimentation and keen perception pay great dividends. In the dry regions where they grow, fungi and botanical mould are unknown and cacti have consequently not built up a resistance against them. Since these moulds are the chief agents for the spreading of rot, it is with respect to this, that whatever an individuals particular methods in other spheres of culture, he must restrict himself to certain general principles necessary for the avoidance of this danger.

Never mix anything that is likely to decay in with the soil intended for cacti. Animal manures and incompletely decayed vegetation should therefore be rigidly excluded. A soil generally recommended is a mixture of coarse sand and loam, with an addition of thoroughly decomposed leaf-mould or well-rotted sod. A small percentage of lime in the form of crushed brick rubble or crushed shells is beneficial. Here, although good results may be obtained with widely varying soils, the key-note is "Good Drainage." Standing water quickly turns stagnant and may easily cause the rapid spread of rot to destroy an entire plant. If rot once starts the only effective remedy is to ruthlessly cut out all the affected portion with a sharp clean knife, and then dust the cut with charcoal or flowers of sulphur, either of which act as a plant-antiseptic. Rot commencing at the base of a plant is a common occurrence unless the pot is well-drained with a layer of crocks and gravel at the bottom of the pot and a good porous soil on top. Pieces of charcoal will be found very useful in this respect as they have a large water absorbing capacity and at the same time keep the soil sweet and clean. Cacti may perhaps sound like delicate children, but it is the care required in cactus culture and the factor of reward and effort that go still further to enhance the growing of these fascinating and attractive plants.

In the case of repotting, care should be taken to damage the roots as little as possible and to remove any that are damaged, whilst after repotting they should not be watered for about three days in order to allow any cuts to heal before being subjected to moisture. Cacti need repotting only if they appear to be making no headway, if they grow too large for the pot or if insects or rot attack the base or roots of the plant.

WATERING

Cacti are indigenous in regions where rainfall is sparse or seasonal. This aspect of their environment may be imitated with advantage when under cultivation. In spring and summer, cacti need watering regularly, always allowing the pot to become almost dry before watering again. The period between waterings will depend therefore on size of pot, the nature of the soil being used and on the temperature. Some authorities declare that watering should cease altogether when a plant is seen to be producing flowers, but this is a matter for debate. Towards the end of September, watering should gradually be reduced almost altogether during winter, which is the resting period so essential to all plants. If the cacti shrivel a little and turn a dull reddish tint this is no cause for alarm but on the contrary is looked upon as a good sign for flowers, in the coming year.

When dry at the roots, cacti are able to withstand cold and even frosts, many varieties being indigenous in regions of high altitude where cold and snows are a common occurrence in the winter. Protection from dripping water and mist is essential, however. In spring, the collector may recommence watering his plants, it being best to choose a bright sunny day. Although opinions differ on the subject, I personally hold that it is best to water cacti, and all pot-plants for that matter, by standing the pots in a tray of water. This method I believe is preferable to watering the soil on top as it not only prevents the soil from caking but spares the various mineral salts from being washed away by water continually passing through the pot. Cacti should at all times be exposed to as much sunlight as possible. In arid regions the contrast between night and day temperatures is usually high, there being no clouds to act as a blanket and hold in the heat of the day. As a result, heavy night-dews are common and this may be simulated by spraying the plants with a syringe which serves to cleanse the pores and retain the brilliance of the spines.

* * *

NIGHT FLOWERS

One of the beauties of cacti is the evanescence of their flowers. Both the sun worshippers and the nocturnal bloomers are indispensable to a complete collection. Their beauty being so fleeting in most cases, it seemed a pity to me to miss seeing a single blossom.

One day in June was so dark and dreary even in the greenhouse that all ready buds merely marked time, not even knowing the day had come and gone. It occurred to me then that I had within my knowledge and means a simple method to display these reluctant day bloomers at a convenient evening hour. After a little calculating I found that the heat and light produced by a 250 watt heat lamp (without the red filter) could simulate the sun's radiation. I mounted the lamp about one foot above the plants and waited. Within 20 minutes the petals of *Echinocereus melanocentrus* began to open and by the time one hour had passed the flower was wide open and recurved in all its glory. Another half hour saw *Echinocereus baileyii* open its beautiful flower. Soon *Rebutia senilis* and *Gymnocalycium bodenbenderianum* were displaying their wares. All this at eight o'clock on a dark, damp, Ohio evening.

Now it is apparent to me that I can avoid missing any of these diurnal bloomers by setting up a time clock on the evening before a bud is to open so that the lamp will go on at about five o'clock in the morning. By the time I awake, shave, and eat breakfast (7:30) all the day's flowers are open before me. No longer do I have to go to work thinking of the sights I will miss.

For one who works at night and might miss the nocturnal display, simulated darkness during the afternoon might advance nightfall.

JEROME F. LOWENSTEIN
Vice Pres. Midwest Cactus and Succ. Society

One of the Little-known Kalanchoes

KALANCHOE PROLIFERA R. Hamet & Perrier de la Bathie.

By H. G. RUSH

Since 1947 I have been growing and studying a plant which Dr. Elzada U. Clover, of the University of Michigan, Ann Arbor, gave to Mrs. Florence Cariss upon the occascion of Mrs. Cariss' visit to the University in 1947. Mrs. Cariss, knowing that the plant comes from Central Madagascar, found that it was very cranky and did not enjoy the conditions found at her home so she gave the plant to Mrs. Rush and myself.

Before ever seeing the plant I had read and studied everything I had been able to find concerning this plant, which was far too little, and I had formed a picture in my mind of what the plant should look like, but upon seeing the plant I found I must change all my original ideas.

Kalanchoe prolifera R. Hamet & Perrier de la Bathie, comes from Central Madagascar in the neighborhood of Analamahitso, growing on the humid basaltic rocks at an altitude of nearly 800 meters.

The plant was first described by Bowie as *Bryophyllum proliferum* from a specimen cultivated in Kew Gardens and which he believed had originated in South Africa. But in 1883 Baker, having studied plants collected by the Reverend Baron in the Central region of Madagascar, considered them to be identical with *Bryophyllum proliferum* and thus nullified the theory of Bowie as to the geographic origin of the species.

During a long sojourn at Kew Gardens, R. Hamet had the opportunity to compare these specimens with the material which he and Perrier de la Bathie had themselves collected in Madagascar and while minor differences occasionally were present, in the main they were found to be identical and to belong to the species which, since the reunion of the genera *Bryophyllum* and *Kalanchoe,* must be designated under the name of *Kalanchoe prolifera* R. Hamet & Perrier de la Bathie.

Kalanchoe prolifera R. Hamet & Perrier de la Bathie, is a perennial glabrous plant, light green but spotted with numerous pale spots. The stem is quadrangular except in the lower part, there cylindric; from one to one and a half meters high, not including the inflorescence, erect but often recumbent in the lower regions; the stems never branching but putting out sterile shoots which eventually flower.

The stems carry leaves along nearly their whole length except at the base, where they are usually bare during flowering. The leaves are opposite, petioled, green but reddened during the dry season, fairly distant one from another and quite equally spaced, fleshy, 6 to 12 cm. long, 4 to 7.5 cm. broad, keeled on the lower face and grooved on the upper face. The petioles are enlarged at the base into a kind of platform, 14 to 20 mm. wide.

The inflorescence is paniculate, 40 to 80 cm. high, 20 to 40 cm. broad, terminating the stalk and is made up of a few lateral peduncles which are in pairs, these sometimes produce secondary peduncles in pairs which are terminated by few-flowered, bi-parted cymes, very little branched.

The flowers are often short and quite often develop into small pseudo-bulbils. The flowers are pendant, with a very pale cream color or nearly white. The corolla is slightly longer than the calyx, cylindric but plainly quadrangular in the lower part and plainly compressed below the middle. The seeds are slightly wider than long.

The flowering plant is shown in the photos, but due to our hot dry winter it was unable to complete its flowering cycle and the buds died before flowering. This plant fits well in any fanciers collection as it is a very striking plant when well grown and makes a fine addition to the collection. So far as I know the plant is not now and has not in the past, been available to the succulent plant collectors who would like to have it but maybe some day it will show up on the market and become available to everyone.

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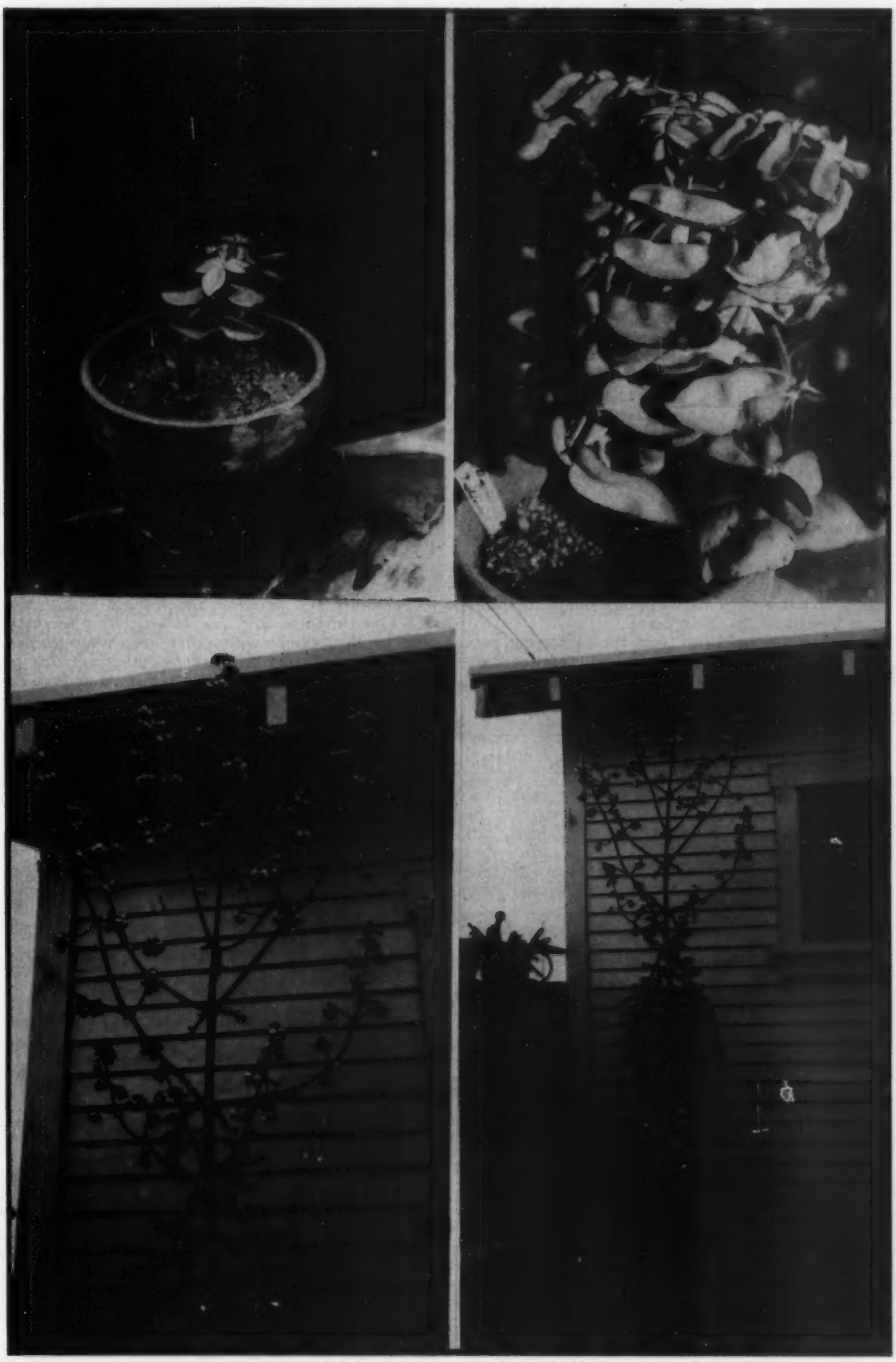

FIG. 106

FIG. 106. *Kalanchoe prolifera. Upper left:* the plant as I first saw it. *Upper right:* Same plant in 1949. *Bottom:* Same plant nine feet high in 1954. Rush photos.

MADAME GANNA WALSKA'S "LOTUSLAND"

By MARY GLADE

On Sunday, June 13th, 1954, the members of the Cactus and Succulent Society of America, Inc., were granted the rare privilege of visiting the beautiful estate of Madame Ganna Walska in Montecito, California. Due to the fact that it was cloudy and had rained in Los Angeles that morning, only about one hundred persons made the trip. The afternoon turned out sunny and warm making it possible for the camera enthusiasts to take color pictures.

On approaching the entrance gates one sees a planting of large Opuntias and a bed of *Echeveria elegans* planted to spell the name of the estate "Lotusland." The drive inside is lined with thousands of plants of *Agave attenuata.* Farther on one comes to a large pond planted with Lotus. As we proceeded along the drive we saw large Agaves and Euphorbias of different species. Except for the cactus beds near the home, the majority of the plants are found in the shade of huge California Live Oak trees.

Walking on towards the large swimming pool we passed a planting of *Dracaena draco,* commonly called the Dragon Tree. One tree was at least fifty feet tall. Beyond these were many *Kalanchoe beharensis* and an enormous planting of Aloes. After considerable urging from the guides, we finally arrived at the swimming pool. One side of the pool has a number of huge South Sea shells which are filled with plants of a white Cotyledon. Under the trees on the other side were feathery tree ferns and hanging from the branches we saw baskets of Staghorn Ferns.

The paths leading away from the swimming pool towards the house were devoted to plantings of Cannas, Begonias, Clivias, Fuchsias, white Hydrangeas, tall Foxglove in bloom and borders of Agapanthus lilies with both blue and white flowers.

At the house we were able to see a large expanse of beautiful lawns with cactus gardens in the distance. In the patio we found baskets of Fuchsias, ferns, orchids and climbing on a trellis a very rare pink Bougainvillea. The plantings in the distance proved to be Espostoas and other hairy cactus, Bromeliads, tall tree ferns, Cycads, Beaucarnias, and colorful Epiphyllums in full bloom. In this area we found Sedums, Echeverias, Cotyledons and Aeoniums growing in beds in the shade of the trees.

The really outstanding specimens of cactus were not seen until we had looked at the other plants. We walked up the drive leading to the front of the home. Along this drive we saw a very striking planting of grass, shrubs and trees all with grayish-blue leaves. Amongst these were specimens of the rare African silver tree. In the cactus beds we saw different species of Echinopsis, Lobivias, Astrophytums and Echinocereus. In the background were large Ferocactus, tall specimens of Cereus and *Carnegiea gigantea.* Up close to the house we were amazed to see plants of Cereus and *Lemaireocereus marginatus* at least 30 to 40 feet tall. What really impressed me most were the great number of buds and flowers along the stems of the *L. marginatus.* A large specimen of *Trichocereus* had at least a dozen flowers open. Among the tall cacti were a ten-foot *Cephalocereus polylophus* and a twenty-foot *C. senilis.*

While we were admiring the plants, Madame Walska came out to talk to some of the visitors and pose for pictures. Everyone enjoyed strolling through the grounds but felt that one visit really couldn't do them justice.

Madame Walska is fortunate in having Ralph Stevens, one of the foremost landscape architects, on her staff; we understand that this estate was his boyhood home and he is familiar with every inch of the massive grounds. Another familiar face was Vincent, the head gardener; many of the older Society members remembered him and his ability in the cactus garden of Mrs. Ysabel Wright where he had charge of her 20-acre cactus garden for more than 20 years.

FROM THE PRESIDENT'S DESK

With the passing of the first half of 1954, the 1955 Convention takes on a greater importance. Mrs. Rush and I have just recently returned from a trip to El Paso during which we had meetings with the El Paso Cactus and Rock Club, our Convention Hosts and with Mr. Leasure, the Convention Chairman, and his Committee. We are happy to report that the plans for 1955 are well advanced and you can look forward to a Convention as large and as interesting as any yet held by the Society with many interesting speakers, colored slides, door prizes, field collecting trips and other events which will be much enjoyed by everyone.

El Paso is an old town, as towns in the West and Southwest go and is situated in a part of the country which is the natural home of many species of cacti and some species of other succulents. Plans have been completed to make it possible for the Convention crowds to visit, see and collect plants from these areas.

Since it is impossible for the Society to sponsor a trip into Southern Mexico in connection with the Convention, due to excessive cost, lack of sufficient time and other difficulties, arrangements have been completed to take this trip by means of excellent colored slides during the Convention. This trip will take you all the way to Tehuacan and the Guatemalan border.

The dates for the Convention are now definitely set as July 8th, 9th, 10th, with the registration office open from 1:00 p.m. to 10:00 p.m. on July 7. July 11 and 12 will be devoted to trips held in two very interesting cactus areas close to El Paso. Start now making your plans to be with us at the 1955 Convention and renew old acquaintances and have fun with the other cactophiles.

A SPECIAL EVENT

On the evening of October 6, at 7:30 p.m., in the Auditorium of the Pasadena Public Library, Walnut St. at Garfield Ave., in downtown Pasadena, the Cactus and Succulent Society of America is presenting a fine talk and program of colored slides, given by Mr. and Mrs. Hector Moir, of Kaloa, Hawaii.

The Moir's have lived in Hawaii for many years and have been interested in and have grown cacti and other succulents during most of this time and have amassed a large collection of fine colored slides of their plants, as well as Bromeliads, Orchids, and other plants which thrive in the islands.

Those of you who like to travel the easy way as well as those who find it impossible to visit the Islands, will not want to miss this fine opportunity to see and hear about this island paradise, including their active volcano.

The meeting is free of charge to the members of the Society, their friends and the general public, so make up a party and be sure not to miss this treat.

Door prizes and ample free parking in the lot behind the Library building. Mark your calendar NOW and you will be thrilled to see how they grow succulent in the Islands.

Never wait for the right time before doing that job around your plants is my motto right now. Too much water and warmth starts spindly growth in most succulents and sickly white growth in cacti. There are plants that you need not worry about if one of these periods of warmth does appear early. These are the Epiphyllums, Rebutias, Haworthias, Aloes, Euphorbias, Rhipsalis, Crassulas (certain types), Mammillarias, etc.

Most etiolated plants in this district regain their color and vigor when given outside treatment after May 1. (April 20th this year.) "The succulents look spindly" is the complaint of most cactophiles that I know. I recommend the outdoors treatment first in light shade then in full sun in morning and afternoon after they harden up .The plants are luxuriant all summer, and withstand the winter storage better the following year. The Epiphyllums and Rhipsalis should be left in light shade at all times to keep that healthy dark green color, however.

Several letters recently have shown great concern at our seeming neglect of the Epiphyllums in our articles. The writers already have read "The Epiphyllum Book" and other pertinent information. It seems strange that I should have been asked the why and the wherefore of the lack of information, but, no no doubt, the writers expected me to pass on their questions to you who do such marvelous things with Epiphyllums (Orchid Cactus). The Epiphyllums are not the easiest of culture, but they are not the most difficult either. I cannot give over too much of my limited greenhouse space to them, however I do have 60 or more (10 true species, 12-15 MacDougall numbered types, 5-10 European origination of English and German origins, and the remainder "Orchid Cactus"). Perhaps a column about Epiphyllums would be the answer such as the excellent one by Harry Johnson.

I thought there were no new "Christmas Cactus" types that I had not seen until a friend sent a specimen to me that never grows more than 6 stems high and spreads from the semi-hardened trunks in such a way that it resembles *"stolon propagation."* The stems and sections are shorter and more deeply serrated. The minute white hairs are in clusters of 3 to 5 in some but not all serrations. White hair one-eighth of an inch (or less) persist from the new growth back as far as one or two joints. Stems near the ground are seldom flat but 3 to 5 sided and quite slender.

The original plant was collected by Dr. William S. Baldwin, formerly of Lorain. Relatives say be brought it back with him from Jerusalem after the First World War. The plant goes by the name of the "Jerusalem Cactus" here in Lorain. It blooms and reports have it that the blooms are either" pink with a white throat" or "purplish pink with a white throat." Dr. Baldwin had his in a "wash tub" and it "filled the complete soil surface," according to his cleaning woman.

I have been asked when it is best to take cuttings. I always answer when you can get them, but I'm sure most will agree with me that while most blooming plants *"slip with some difficulty"* that most Cacti and Succulents can be taken and rooted if the cutting box has a warm location or is "under-heated" in cold weather. I never refuse a cutting or neglect to plant a "breaking" no matter when the time (cold, hot, warm, wet or dry).

From the newest spray literature, which has been sent me as well as my current reading, I have come to the conclusion that we are on the verge of a new era in which plants kill off their enemies (and friends as well at times) by new chemicals which are used so that they become organically part of the plant system. Systematic insecticides is the name used and they are based on "organic phosphorous" uses which came from World War II. The material is absorbed through the roots and spreads to the rest of the plant. "In a few days it becomes concentrated enough so that when chewing and sucking insects attack the plant, they're poisoned and die." The new systematics are poisonous, but no more so than other insecticides in general use.

The problem, if used on fruits, etc., is to spray at least six weeks before harvesting as the poisonous phosphorous compounds break up into harmless substances or are thrown off by the plant. They are being used at the University of California's Citrus Experiment Station at Riverside, California, at present. The staff are testing 500 such compounds. *"Plants That Bite Back,"* Dr. Robert L. Metcalf of the University, calls them.

At present they are not available to us cactophiles, but the selenates are as well as several others which may be toxic or not as growers begin using them. So far selective insecticides have not been developed as far as I'm concerned and my friends are not going to be injured after I've built up the friendly array in my greenhouse. The spine bug is rare in my collection because I have sponsored white-faced wasps of ⅛ to ¼ inch in length, and others that only work now and then for me.

I read anything that is sent me about the newer sprays and the claims made. However, I reserve the right to make my own decisions. One of which is that a few harmful insects will persist in my preserve no matter what insecticides I use and no greenhouse that is well established should spray indiscriminately with any wonder spray at the expense of his numerous friendly allies which have been at work inside and outside the pots to establish a balanced order. In other words insects are much better adapted to live on this earth than I am so why not let nature fight a battle and this I do. Insects have been on this earth some 250,000,000 years. Each year scientists produce some new and more deadly insecticide in their effort to destroy them. It has failed to exterminate one single species of the 700,000 varieties known as far as I can ascertain.

I do not belittle the attempts made but I do say we should learn to use our own sources of natural enemies, thousand-leggers, minute wasps, pill bugs, wasps, hornets, etc. There is no residue left on the powdery surfaces, no soils to be buried later, no need to protect children and pets from fumes, powders and other harmful materials; and there is a feeling of living with nature as a part of it not as a lone wolf set against the backyard world in which we live.

It is said that the wild plants have over a period of eternities built up a cooperative of leaves for insects, to feed birds to live and nest and protect them. Some people say, what man has meddled with God has not always given strength to survive. Whether it's philosophy or logic I know my weeds do fine right beside my not so healthy "*man*-developed" flowers, shrubs and trees.

At least one thing is not going to be blamed upon man from now on and that is the Southwest Deserts. Professor Sheldon Judson, University of Wisconsin, claims that "Climate shifts changed the American

Southwest from the grass-carpeted land discovered by the first white explorers some 400 years ago with the deserts and dry arroyo, to be found today." Records kept over the past 100 years show little change in total annual rainfall but friend B. Leopold of the U. S. Geological Survey reports "that the last half of the 19th century has had unusually large proportion of heavy rains of over one inch and an unusually small proportion of light ones."

This is not the first cycle of such dryness as there are evidences of two or three others according to Judson. "We seem to be on the upswing of the climatic cycle of erosion and rehealing. Although the cycle is slow, recovery will again make the Southwest the green grasslands that the Spanish found four centuries ago.

It is no surprise to me—as old timers in Colorado told me in 1951—wheat was again becoming a more general Colorado crop, also "heavy rains" in Texas, Arizona and New Mexico have been reported in our daily papers. Cacti will not suffer I'm sure as my Southwesterns have had an excess of rain this spring as well as hot weather and some of mine I thought looked more contented than in dryer springs.

JOHN E. C. RODGERS
1229—8th Street, Lorain, Ohio

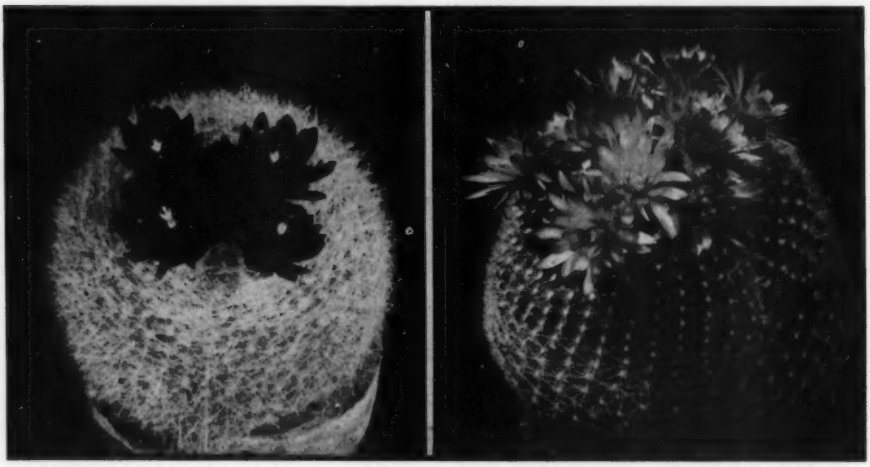

FIG. 107. *Left: Notocactus haselbergii* with scarlet flowers. *Right:* Another variety of the same plant.

PLANT OF THE MONTH

By HARRY JOHNSON

Notocactus haselbergii

Scarlet Ball Cactus

While this plant has long been known it is always very scarce as the seeds are very tiny and consequently the young plants take a long time to reach any size. They are native to southern Brazil where they grow in semi-deserts. The plants are 2 to 4 inches across, globular and entirely covered with very short, slender white spines from closely set, woolly areoles. There are about 30 low, tubercled ridges. The flowers are brilliant orange-red or crimson, borne right at the top along the margin of the depressed center. They last longer than almost any cactus flower I know—some two weeks each. They enjoy a little shade with plenty of fresh air. Moderate waterings when dry. Porous soil with some leafmold and sand. They have, with me, withstood about 8° of frost without injury, when summer hardened. A new genus has recently been erected, *Brasilicactus,* to which it has been assigned by some students together with *N. graessneri.* It is different in some characters from most other members of *Notocactus.* You may use the new name if you choose.

SPINE CHATS

LADISLAUS CUTAK

MESA de MAYA, known locally in Oklahoma as the Black Mesa, and the region about it was chosen for vegetational study by C. M. Rodgers because of its critical location at the meeting point of the flora of the plains with that of the Rocky Mountains. The Mesa region lies in portions of three adjoining states —Colorado, New Mexico and Oklahoma. The outstanding feature of the region, of course, is the Black Mesa, a lava-capped tableland, approximately 45 miles long and varying from 1 to 6 miles in width. The vegetation of the region is classified into prairie community, the foothill community, the mountain community and the riparian community. Cactus fans will be interested to learn that the following cacti and other succulents are to be found in this fascinating region: *Coryphantha deserti, Echinocereus viridiflorus, Coryphantha vivipara, Opuntia imbricata, O. fragilis, O. phaeacantha, O. polyacantha, O. rhodantha, O. schweriniana, O. tortispina, O. trichophora, Yucca glauca, Y. harrimanae* and *Talinum parviflorum*. The full report of the vegetational study of the Mesa de Maya region can be found in LLOYDIA 16: 257-290, December, 1953.

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The Coryndon Museum Expedition to Southern Ethiopia and Somalia was organized to facilitate the investigation of Euphorbia, Monadenium and other succulents and general botanical collecting by Mr. P. R. O. Bally and for the investigation and study of the genus ALOE at recorded type localities and elsewhere in those regions by G. W. Reynolds. During the travel, amounting to 3,750 miles, a large number of Aloe habitat photographs was secured and many herbarium specimens prepared. Two new Aloes were found in Southern Ethiopia and these are named and described in the January, 1954, issue of The Journal of South African Botany. The first is *Aloe calidophila,* a succulent low shrub which was found in large numbers on arid plains in intensely hot places, suggesting the specific epithet; the second is *A. yavellana,* which occurs in great numbers for a mile or more along the northeastern slopes of Mega Mountain in forest, in clearings, or on rocks, in places very difficult to find. In leaf character, *A. calidophila* approaches *A. microdonta* but the latter is immediately separated by its oblique lax racemes with secund red flowers. *Aloe yavellana* has bronze-brown leaves and capitate racemes with the smallest flowers in the *Prolongatae* group to which it belongs. Another distinguishing character found in the flowers is the dark scarlet bud grey-striped in the upper third and minutely white-flecked throughout.

* * *

Martin Cardenas describes two new Trichocerei from Bolivia in the August, 1953, issue of *Revista de Agricultura*. The first is *Trichocereus taquimbalensis,* a simple or branching cactus which attains a height of 6 or more feet, and the second is *T. camarguensis,* a columnar, much smaller and cespitose cactus which is comparable to *T. strigosus* from the deserts of western Argentina. The first species produces stems with 9 obtuse ribs and bears 8 to 13 radial spines and one robust horizontal central in each areole. The second new species has 14 obtuse ribs bearing prominent circular areoles with 12 to 13 radial spines and 2 to 3 centrals. The flowers of *T. taquimbalensis* are produced from apex of stems and are white with brownish sepals while those of *T. camarguensis* are lateral from a circle near the top of branch and are white with purple green sepals.

* * *

A new pincushion cactus, *Mammillaria carmenae,* was recently described by Marcelino Castañeda and Nuñez de Caceres in Anales del Instituto de Biologia, Mexico (vol. 24, No. 2, 1953). It was collected in the state of Tamaulipas at Rancho "La Reja." It is described as a caespitose globular cactus with loose, conic, elongated tubercles and white campanulate flowers. The axils of tubercles bear white wool and long white translucent bristles. In each areole there are about 100 very small whitish to clear yellow radial spines. No central spines are detected. The new cactus was named in honor of Profesora Carmen Gonzalez Castañeda, wife and collaborator of the author.

* * *

I was simply entranced by the garden which Elmer Lorenz created on his property in the Eagle Rock district of Los Angeles where he makes his home. His house sets well above the level of the street and almost the entire backyard has been covered with lath under which he grows all kinds of tropical plants. The living room wall facing the lath-house is mostly glass so that the illusion of living in a jungle is created. On the other end of the property stands the home of Elmer's mother who likewise has a wonderful view of the tropic scene. As guest of the Lorenz' household last summer we all used to gather in the garden for lunch and gabfest, the while listening to the tinkle of a tiny waterfall shrouded by delicate greenery. Elmer has always been interested in plants. While trying to create a tropical atmosphere in his lath-house the epiphytic cacti were brought to his attention, particularly members of the Rhipsalis subtribe. He has also become very fond of Aloes. This interest was born one day many years ago while visiting and viewing the marvelous collection at the Huntington Garden in San Marino. Of course, as may be expected, this interest keeps growing and has broadened out to include many cacti and succulents in his garden, especially now since he has acquired a larger parcel of land at his present location. The lath-house garden is a veritable rain forest on a small scale where aroids, ferns, begonias, jungle cacti and miscellaneous other foliage plants thrive exuberantly. Along one boundary of his property Elmer has designed and executed an interesting rockery which is now filled with choice succulents. Every bit of colorful rock had to be bought and hauled to the spot. Elmer says that he hasn't any preference for any certain plants but that he can become enthused over any living xerophyte as well as dainty epiphyte or ornamental terrestrial. He likes to try anything that is new or unusual and often sends me seeds or cuttings for trial in St. Louis which is always appreciated. Elmer also has a passion for horticultural and botanical books as well as botanical prints, of which he now has a very nice collection.

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This new column should prove helpful to those who are endeavoring to build up their collection. We must ask that the lists be short and typewritten or written clearly. Please do not list common plants that are easy to obtain from any dealer; the purpose of the column is to find rarer plants that are seldom stocked by dealers. Address the Cactus Journal, 132 West Union Street, Pasadena 1, California.

WANTED: All members of the *Neobesseya* family and *Opuntia grandiflora*, will exchange anything Central Texas has. C. L. CHANCE, 2409 Northland Drive, Austin, Texas.

I would like to get starts of: *Crassula anomaloe, C. orbicularis, C. rosularis, C. tabularis, C. columnaris, Echeveria cuspidata, E. crenulata, E. desmetiana, E. hoveyii, Kleinia anteuphorbium, K. neriifolia, Euphorbia stellata, E. monteiroi, E. alicornis, Cotyledon ventricosa, Fockea capensis, Sarcostemma viminale, Zygophyllum fontanssii.* Most of these plants are listed in Jacobsen's book, and may be hard to find here. I offer in exchange a number of Crassulas, Sedums, Kalanchoes, Euphorbias, Echeverias, Kleinias, Aloes, Haworthias, Gasterias and Epiphyllums, named. In the fall I will make up a mimeographed list. MRS. KARL WIHTOL, Red Hill Road, Middleton, New Jersey.

I have about 70 species of Agaves, but I cannot locate an *Agave pumila.* Perhaps some Journal reader would like to exchange *A. pumila* for practically any other species. HAYES C. SCHLUNDT, 840 Seco Street, Pasadena 3, California.

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This book was published by the U. S. Dept. of Agriculture as Monograph 17. We cannot supply further copies but it might still be available from the Government Printing Office (50c).

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ANNOUNCEMENT

We have purchased the entire stock and book business of Book Mark of Tucson, Arizona. Formerly of Los Angeles, Frank Mark is well known for his cactus collection which now features a very large collection of crests. He is retiring from the book business to engage in other interests.

After completing a 400 page book, I plan to issue a combined list of our many out-of-print papers and books. After five years I have also completed the reprinting of the first 27 months of the JOURNAL and my new list will include prices of complete sets (25 years), single volumes bound and unbound, and odd copies with a list of their contents. This is a huge project but the list will be one of most valuable that has ever been circulated.

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